

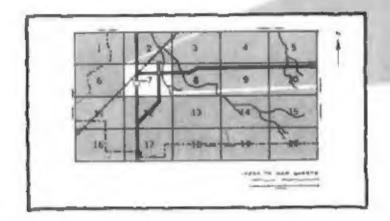
Soil Conservation Service In cooperation with
United States
Department of
the Interior,
Bureau of
Indian Affairs,
and the South Dakota
Agricultural Experiment
Station

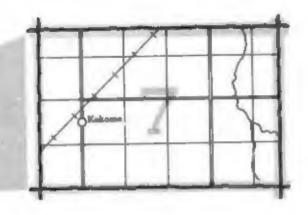
# Soil Survey of Brule and Buffalo Counties, South Dakota



# HOW TO USE

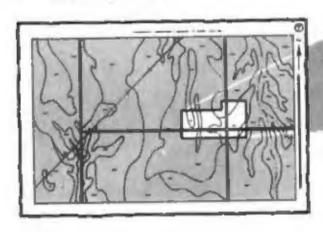
Locate your area of Interest on the "Index to Map Sheets;"

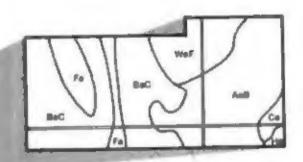




2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

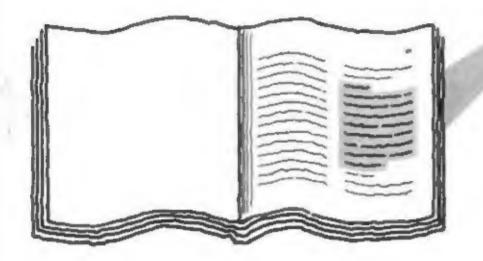




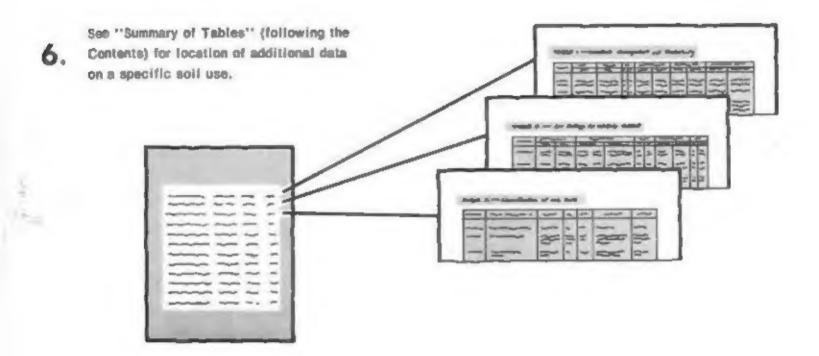
List the map unit symbols that are in your area. Symbols AsB WaF. BaC Fa BaC Ce A&B Fa BeC Ge-Ha WaF Fa

# THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.







Consult "Contents" for parts of the publication that will meet your specific needs.

7. agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1982. Soil names and descriptions were approved in 1983. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1963. This survey was made cooperatively by the Soil Conservation Service; the United States Department of the Interior, Bureau of Indian Affairs; and the South Dakota Agricultural Experiment Station. It is part of the technical assistance furnished to the Brule-Buffalo Conservation District. Financial assistance was furnished by the South Dakota Department of Revenue, the Old West Regional Commission, the Bureau of Indian Affairs, and the Brule Buffalo County Commissioners.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: An eres of Sansarc-Opel clays, 20 to 40 percent slopes, on breaks along the Missouri River. This area is used for range.

## Contents

Index to map units	iv	Recreation	63
Summary of tables	W	Wildlife habitat	40.4
Foreword	vli	Engineering	
General nature of the survey area	1	Soil properties	The Control of the Co
How this survey was made		Engineering index properties	CONTRACTOR LA LA CONTRACTOR LA
Map unit composition		Engineering index properties	
General soil map units	5	Physical and chemical properties	
Soil descriptions	5	Soil and water features	
Detailed soil map units	1	Engineering index test data	
Soil descriptions		Classification of the soils	
Prime farmland		Soil series and their morphology	
Use and management of the soils	55	Formation of the soils	105
Crops and pasture	55	References	107
Rangeland		Glossary	109
Native woods, windbreaks, and environmental		Tables	115
plantings	62		
Soil Series			
Artesian series	. 75	Kolls series	
Beadle series	. 76	Lane series	
Betts series	- 77	Lowry series	
Bon series	- 78	Lowry Variant	93
Bullcreek series	. 79	McClure series	93
Carter series.	. 79	Millboro series	
Cavo series	80	Mobridge series	95
Chantier series	81	Oahe series	
DeGrey series	81	Okalon series	96
Delmont series	82	Oko series	96
Dorna series	- 83	Opal series	97
Durrstein series	- 83	Orton series	98
Eakin series	84	Plankinton series	
Egas series	- 84	Promise series	99
Egas Variant		Ree series	100
Farmsworth senes	86	Sansarc series	
Gettys series	- 86	Schamber series	
Glenham series	- 87	Sully series	
Highmore series	- 88	Uly series	
Hurley series	- 68	Wendte series	
Java series		Worthing series	THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TRANSPORT NAMED IN COLUMN TWO IS NAMED I
lorguld sories	00	TYGUMN SCHOOLSON CONTRACTOR CONTRACTOR	*************

Issued December 1985

# Index to Map Units

Ar-Artesian sitly clay loam BeB—Beadle loam, 2 to 6 percent slopes BeC—Beadle loam, 6 to 9 percent slopes BeC—Beadle loam, 6 to 9 percent slopes BeC—Beadle loam, 6 to 9 percent slopes BeB—Beadle-Jerauld complex, 1 to 5 percent slopes BmF—Betts-Java loams, 20 to 40 percent slopes Bm—Bon loam. Bm—Bon loam. Bn—Bon loam. Bu—Bullcreek clay. Bu—Bullcreek clay. Bu—Bullcreek clay. Bu—Carter-Promise complex. Cp—Carter-Promise complex. Cp—Carter-Promise complex. Cp—Carter-Bill loams. Cp—Carter-Bill loams. Dah—Delemont loams, 2 to 6 percent slopes. Cp—Chantier-Sansarc clays, 2 to 15 percent slopes. Cp—Chantier-Sansarc clays, 2 to 15 percent slopes. Cp—Durstein sill loams. Du—Durstein sill loams. Du—Durst	35
BeG—Beadle Jeraulid complex, 1 to 5 percent slopes   BgB—Beadle-Jeraulid complex, 1 to 5 percent   slopes   Bm—Bont loam.   Bon—Bont loam.   Bon—Bont loam.   Bon—Bont loam.   Bu—Bullicreek clay.   Bu—Bullicreek clay.   Bu—Bullicreek clay.   Bu—Carter Promise complex   Cr—Cavo-Jeraulid sitt loams.   Bon—Bont loam.   Bon—Bont loam.   Bu—Bullicreek clay.   Bu—Mulliboro silty clay loam.    Bu—Bu—Bullicreek clay.   Bu—Bulliboro silty clay loam.    Bu—Du—Bulliboro silty clay loam.	35
BgB—Beadle-Jerauld complex, 1 to 5 percent slopes   17	35
slopes BmF—Betts-Java loams, 20 to 40 percent slopes Bn—Bon loam, channeled Bo—Bullcreek clay Ca—Carter sift loam Cp—Carter-Promise complex Cp—Carter-Promise complex CsD—Chantier-Sansarc clays, 2 to 15 percent slopes Da—Dulbroam loams, 2 to 15 percent slopes Da—Dumstein silt loams Dup—Dumstein	36
BmF—Betts-Java loams, 20 to 40 percent slopes Bn—Bon loam. Bo—Bon loam. Bu—Bullcreek clay Bu—Muboriogle-Plankinton sit loams Bu—Bullcreek clay Bu—Mbo-Bullcreek clay Bu—Mbo-Bullcreek clay Bu—Mbo-Bullcreek clay Bu—Mbo-Bullcreek clay Bu—Mbo-Bullcreek clay Bu—Bullcreek clay Bu—Mbo-Bullcreek clay Bu—Bullcreek clay Bu—Bullcree	30
Bn—Bon loam.  Bo—Bon loam, channeled  Bu—Bullcreek clay  Ca—Carter silt loam  Cp—Carter-Promise complex  Cr—Cavo-Jerauld silt loams.  CsD—Chantier-Sansarc clays, 2 to 15 percent slopes.  DaA—DeGrey-Eakin-Jerauld silt loams, 0 to 2 percent slopes.  DaA—Delmont loam, 6 to 15 percent slopes.  Da—Doma silt loam.  Du—Durnstein silt loams.  Du—Durnstein silt loams.  Slopes.  Eg—Egas silty clay loam.  Eg—Egas silty clay loam.  Eg—Egas variant silty clay loam.  Eg—Egas silty clay loam, 25 to 40 percent slopes.  Eg—Egas silty clay loam, 35 to 40 percent slopes.  Egh—Gelicham-Java loams, 3 to 6 percent slopes.  Egh—Glighnam-Java loams, 3 to 6 percent slopes.  Eg—Highmore-Java complex, 5 to 9 percent slopes.  HMA—Highmore-Mobridge silt loams, 0 to 4 percent slopes.  Eg—Sansarc-Opal clays, 20 to 40 percent slopes.  Eg—Suñy silt loam.  Egh—Rock outcrop-Sansarc complex, 15 to 40 percent slopes.  Saf—Sansarc-Opal clays, 20 to 40 percent slop	36
Bo—Bon loam, channeled Bu—Builcreek clay Bu—Builcreek clay Ca—Carter sitt loam Ca—Carter sitt loam Cp—Carter-Promise compiex Cp—Carter-Promise compiex Cs—Cavo-Jeraulid sitt loams. Cs—Chantier-Sansarc clays, 2 to 15 percent slopes Sopes—Chantier-Sansarc clays, 2 to 15 percent slopes DeD—Chantier-Sansarc clays, 2 to 15 percent slopes Sopes—Okation bouldery sitty clay, 15 to 40 percent slopes OkB—Oko loam, 2 to 7 percent slopes OkB—Oko loam, 2 to 6 percent slopes Om—Opal sitty clay, 2 to 6 percent slopes Opp—Opal clay, saline, 1 to 6 percen	37
Bu-Builcreek clay Ca-Carter sit loam Ca-Carter sit loam Cp-Carter-Promise compiex Cp-Carter-Promise compiex CsD-Chantier-Sansarc clays, 2 to 15 percent slopes CsB-OksD-Okston bouldery sitty clay, 15 to 40 percent slopes CsB-Oks loam, 2 to 7 percent slopes CsB-Oks loam, 2 to 7 percent slopes CsB-Oks loam, 2 to 7 percent slopes CsB-Oks loam, 2 to 6 percent slopes CsB-Oks loam, 2 to 7 percent slopes CsB-Oks loam, 2 to 8 percent slopes CsB-Oks loam, 2 to 7 percent slopes	38
Ca—Carter silt loam	38
CP—Carter-Promise complex Cr—Cavo-Jerauld silt loams. CsD—Chantier-Sansarc clays, 2 to 15 percent slopes Slopes DaA—DeGrey-Eakin-Jerauld silt loams, 0 to 2 percent slopes DeD—Delmont loam, 6 to 15 percent slopes DeD—Delmont loam, 6 to 15 percent slopes DeD—Durnstein silt loam Du—Durnstein silt loam EaA—Eakin-DeGrey silt loams, 0 to 3 percent slopes Eg—Egas silty clay loam Ew—Egas Variant silty clay loam Ew—Egas Variant silty clay loam Ew—Egas Variant silt loam Ege—Gettys clay loam, 25 to 40 percent slopes Egh—Gelenham Java loams, 3 to 6 percent slopes Egh—Highmore-Java complex, 1 to 5 percent slopes End—Highmore-Java complex, 5 to 9 percent slopes End—Hurley silt loam, 0 to 6 percent slopes End—Hurley silt loam, 0 to	39
Cr—Cavo-Jerauld silt loams.  CsD—Chantier-Sansarc clays, 2 to 15 percent slopes  DaA—DeGrey-Eakin-Jerauld silt loams, 0 to 2 percent slopes  DaB—Delmont loam, 6 to 15 percent slopes  Do—Dorna silt loam  Du—Durrstein silt loam  Du—Durrstein silt loams  EaA—Eakin-DeGrey silt loams, 0 to 3 percent slopes  Eg—Egas silty clay loam  Ew—Egas Variant silty clay loam  Ew—Egas Variant silty clay loam  Ew—Egas Variant silty clay loam  GeE—Gettys clay loam, 9 to 25 percent slopes  Geh—Gettys clay loam, 9 to 25 percent slopes  Geh—Glenham Java loams, 3 to 6 percent slopes  GRA—Glenham-Java complex, 1 to 5 percent slopes  HgB—Highmore-Java complex, 1 to 5 percent slopes  HgB—Highmore-Java complex, 5 to 9 percent slopes  HgB—Highmore-Mobridge silt loams, 0 to 4 percent slopes  HgB—Highmore-Java complex, 1 to 5 percent slopes  HgB—Hurley silt loam, 0 to 6 percent slopes  HgB—Highmore-Mobridge silt loams, 0 to 4 percent slopes  SoE—Schamber loam, 9 to 25 percent slopes  SoE—Sully-Lowry silt loams, 6 to 9 percent slopes  SoE—Sully-Lowry silt loams, 9 to 25 percent slopes  SoE—Sully-Lowry silt loams, 9 to 25 percent slopes  SoE—Sully-Schamber complex, 9 to 25 percent slopes  SoE—Sully-Lowry silt loams, 0 to 2 percent slopes  SoE—Sully-Schamber complex, 9 to 25 percent slopes  SoE—Sully-Schamber complex, 9 to 25 percent slopes  SoE—Sully-Schamber complex, 9 to 25 percent slopes	39
CF—Cavo-Gratid sit loams. CsD—Chantier-Sansarc clays, 2 to 15 percent slopes  DaA—DeGrey-Eakin-Jerauld sit loams, 0 to 2 percent slopes.  DeD—Delmont loam, 6 to 15 percent slopes.  De—Dorna sit loam.  Du—Durrstein sit loam.  Du—Durrstein sit loams.  Du—Durstein sit loams.  EaA—Eakin-DeGrey sit loams, 0 to 3 percent slopes.  Eg—Egas sity clay loam.  Ew—Egas Variant silty clay loam.  Ew—Egas Variant silty clay loam.  Es—Farmsworth sit loam.  De—Plankinton s	40
Slopes Sl	
DaA—DeGrey-Eakin-Jerauld silt loams, 0 to 2 percent slopes DeD—Delmont loam, 6 to 15 percent slopes Do—Doma silt loam Du—Durrstein silt loam Du—Durrstein silt loam EaA—Eakin-DeGrey silt loams, 0 to 3 percent slopes Eg—Egas silty clay loam Ew—Egas Variant silty clay loam Ew—Egas Variant silty clay loam Ew—Egas Variant silt loam Ege—Gettys clay loam, 9 to 25 percent slopes Egh—Gettys clay loam, 25 to 40 percent slopes Egh—Glenham loam, 0 to 3 percent slopes Egh—Highmore-Java complex, 1 to 5 percent slopes Ew—Egas Silty clay loam, 0 to 6 percent slopes Egh—Highmore-Java complex, 5 to 9 percent slopes Egh—Highmore-Mobridge silt loams, 0 to 4 percent slopes Egh=Geh—Hurley silt loam, 0 to 6 percent slopes Egh=Geh—Egh silt silt silt silt silt silt silt silt	40
DaA—DeGrey-Eakin-Jerauld silt loams, 0 to 2 percent slopes percent slopes.  DeD—Delmont loam, 6 to 15 percent slopes 22 OpB—Opal silty clay, 6 to 11 percent slopes OpB—Opal silty clay, 6 to 12 percent slopes OpB—Opal silty clay, 6 to 12 percent slopes OpB—Opal silty clay, 6 to 13 percent slopes OpB—Opal silty clay, 6 to 11 percent slopes OpB—Opal silty clay, 6 to 12 percent slopes OpB—Opal silty clay, 6 to 11 percent slopes OpB—Opal silty clay, 6 to 12 percent slopes OpB—Opal silty clay, 6 to 12 percent slopes OpB—Opal silty clay, 6 to 11 percent slopes OpB—Opal silty clay, 6 to 11 percent slopes OpB—Opal silty clay, 6 to 12 percent slopes OpB—Opal silty clay, 6 to 11 percent slopes OpB—Opal silty clay, 6 to 11 percent slopes OpB—Opal silty clay, 6 to 12 percent slopes OpB—Opal clay, saline, 1 to 6 percent slopes OpB—Opal clay, s	40
percent slopes DeD—Delmont loam, 6 to 15 percent slopes DeD—Dorna sit loam Du—Durrstein sit loam EaA—Eakin-DeGrey sit loams, 0 to 3 percent slopes Eg—Egas sity clay loam Ew—Egas Variant sitty clay loam Ew—Eyam-Ivaliant loam Ew—Plankinton sit loam Eyam-Ivaliant loa to 1 to 2 percent slopes Eyam-Ivaliant loam Eyam-Ivaliant lo	41
DeD—Delmont loam, 6 to 15 percent slopes Do—Dorna silt loam Du—Durrstein silt loam EaA—Eakin-DeGrey silt loams, 0 to 3 percent slopes Eg—Egas silty clay loam Ew—Egas Variant silty clay loam Ee—Gettys clay loam, 9 to 25 percent slopes Eg—Gettys clay loam, 9 to 25 percent slopes Egh—Gettys clay loam, 25 to 40 percent slopes Egh—Gelenham Java loams, 3 to 6 percent slopes Egh—Highmore-Java complex, 1 to 5 percent slopes Eg—Egas silty clay loam Ew—Egas Variant silty clay loam Ew—Egas Variant silty clay loam Eg—Framsworth silt loam Eg—Framsworth silt loam Eg—Framsworth silt loam Eg—Gettys clay loam, 9 to 25 percent slopes Eg—Gettys clay loam, 9 to 25 percent slopes Eg—Gettys clay loam, 9 to 5 percent slopes Eg—Framsworth silt loam Eg—Framsworth s	41
Do—Durrstein silt loam	42
Du—Durrstein silt loam	42
EaA—Eakin-DeGrey sitt loams, 0 to 3 percent slopes  Eg—Egas silty clay loam  Ew—Egas Variant silty clay loam  Fa—Farmsworth silt loam  GeE—Gettys clay loam, 9 to 25 percent slopes  GeF—Gettys clay loam, 25 to 40 percent slopes  GhA—Glenham loam, 0 to 3 percent slopes  GkB—Glenham-Java loams, 3 to 6 percent slopes  HgB—Highmore-Java complex, 1 to 5 percent slopes  Slopes  HmA—Highmore-Mobridge silt loams, 0 to 4 percent slopes  Hobe—Hurley silt loam, 0 to 6 percent slopes  SoC—Sully-Lowry silt loams, 9 to 25 percent slopes  SoE—Sully-Schamber complex, 9 to 25 percent slopes	43
Eg—Egas silty clay loam	43
Eg—Egas sitly clay loam	40
Ew—Egas Variant silty clay loam	40
Fa—Farmsworth silt loam  GeE—Gettys clay loam, 9 to 25 percent slopes  GeF—Gettys clay loam, 25 to 40 percent slopes  GhA—Glenham loam, 0 to 3 percent slopes  GkB—Glenham-Java loams, 3 to 6 percent slopes  High-Highmore-Java complex, 1 to 5 percent  Slopes  HmA—Highmore-Mobridge silt loams, 0 to 4 percent  Slopes  Hob—Hurley silt loam, 0 to 6 percent slopes  Hob—Hurley silt loam, 0 to 6 percent slopes  Hob—Hurley-Slickspots complex, 1 to 4 percent  Slopes  Hob—Java-Betts loams, 9 to 20 percent slopes  Jobe—Java-Betts loams, 9 to 20 percent slopes	43
GeE—Gettys clay loam, 9 to 25 percent slopes	44
GeF—Gettys clay loam, 25 to 40 percent slopes.  GhA—Glenham loam, 0 to 3 percent slopes.  GkB—Glenham-Java loams, 3 to 6 percent slopes.  HgB—Highmore-Java complex, 1 to 5 percent slopes.  SaE—Sansarc-Opal clays, 12 to 20 percent slopes.  SaF—Sansarc-Opal clays, 20 to 40 percent slopes.  SaF—Sansarc-Opal clays, 20 to 40 percent slopes.  SaF—Sully silt loam, 9 to 30 percent slopes.  SaF—Sully silt loams, 25 to 40 percent slopes.  SaF—Sully-Lowry silt loams, 6 to 9 percent slopes.  SaF—Sully-Lowry silt loams, 9 to 25 percent slopes.  SaF—Sully-Lowry silt loams, 9 to 25 percent slopes.  SaF—Sully-Schamber complex, 9 to 25 percent slopes.	44
GhA—Glenham loam, 0 to 3 percent slopes	45
GkB—Glenham-Java loams, 3 to 6 percent slopes.  HgB—Highmore-Java complex, 1 to 5 percent slopes.  HgC—Highmore-Java complex, 5 to 9 percent slopes.  HmA—Highmore-Mobridge silt loams, 0 to 4 percent slopes.  HoB—Hurley silt loam, 0 to 6 percent slopes.  HoB—Hurley-Slickspots complex, 1 to 4 percent slopes.  HgB—Rock outcrop-Sansarc complex, 15 to 40 percent slopes.  SaE—Sansarc-Opal clays, 12 to 20 percent slopes.  SaE—Sansarc-Opal clays, 20 to 40 percent slopes.  ScE—Schamber loam, 9 to 30 percent slopes.  SoC—Sully-Lowry silt loams, 6 to 9 percent slopes.  SoE—Sully-Lowry silt loams, 9 to 25 percent slopes.  SoE—Sully-Lowry silt loams, 9 to 25 percent slopes.  SoE—Sully-Schamber complex, 9 to 25 percent slopes.  SoE—Sully-Schamber complex, 9 to 25 percent slopes.  SoE—Sully-Lowry silt loams, 9 to 25 percent slopes.	45
HgB—Highmore-Java complex, 1 to 5 percent slopes	46
High-Highmore-Java complex, 1 to 5 percent slopes	
Salt—Sansarc-Opal clays, 12 to 20 percent slopes.  Highware-Java complex, 5 to 9 percent slopes.  Highware-Mobridge silt loams, 0 to 4 percent slopes.  Hob—Hurley silt loam, 0 to 6 percent slopes.  Hob—Hurley-Slickspots complex, 1 to 4 percent slopes.  Jobe—Java-Betts loams, 9 to 20 percent slopes.  27  Salt—Sansarc-Opal clays, 12 to 20 percent slopes.  ScE—Schamber loam, 9 to 30 percent slopes.  Solf—Sully silt loam, 25 to 40 percent slopes.  Solf—Sully-Lowry silt loams, 6 to 9 percent slopes.  Solf—Sully-Lowry silt loams, 9 to 25 percent slopes.  Solf—Sully-Schamber complex, 9 to 25 percent slopes.  Solf—Sully-Lowry silt loams, 9 to 25 percent slopes.	46
Salf—Sansarc-Opal clays, 20 to 40 percent slopes	46
ScE—Schamber loam, 9 to 30 percent slopes  HmA—Highmore-Mobridge silt loams, 0 to 4 percent slopes  SoE—Schamber loam, 9 to 30 percent slopes  Sof—Sully silt loam, 25 to 40 percent slopes  SoC—Sully-Lowry silt loams, 6 to 9 percent slopes  SoE—Sully-Lowry silt loams, 9 to 25 percent slopes  SoE—Sully-Schamber complex, 9 to 25 percent slopes  SoE—Sully-Schamber loam, 9 to 30 percent slopes  SoE—Sully-Schamber loam, 9 to 30 percent slopes  SoE—Sully-Schamber loam, 9 to 30 percent slopes  SoE—Sully-Sully silt loam, 25 to 40 percent slopes  SoE—Sully-Sully silt loam, 9 to 20 percent slopes  SoE—Sully-Sully silt loam, 25 to 40 percent slopes  SoE—Sully-Sully silt loam, 9 to 25 percent slopes  SoE—Sully-Sully silt loam, 9 to 25 percent slopes  SoE—Sully-Sully silt loam, 9 to 20 percent slopes  SoE—Sully-Sully silt loam, 9 to 20 percent slopes  SoE—Sully-Sully silt loam, 9 to 20 percent slopes  SoE—Sully-S	47
HMA—Highmore-Mobridge sit loams, 0 to 4 percent slopes	47
slopes 29 SoC—Sulfy-Lowry silt loams, 6 to 9 percent slopes 29 SoE—Sulfy-Lowry silt loams, 9 to 25 percent slopes 29 SoE—Sulfy-Lowry silt loams, 9 to 25 percent slopes 29 SoE—Sulfy-Lowry silt loams, 9 to 25 percent slopes 29 SoE—Sulfy-Lowry silt loams, 9 to 25 percent slopes 29 SoE—Sulfy-Lowry silt loams, 9 to 25 percent slopes 29 SoE—Sulfy-Lowry silt loams, 9 to 25 percent slopes 29 SoE—Sulfy-Lowry silt loams, 9 to 25 percent slopes 29 SoE—Sulfy-Lowry silt loams, 9 to 25 percent slopes 29 SoE—Sulfy-Lowry silt loams, 9 to 25 percent slopes 29 SoE—Sulfy-Lowry silt loams, 9 to 25 percent slopes 29 SoE—Sulfy-Lowry silt loams, 9 to 25 percent slopes 29 SoE—Sulfy-Lowry silt loams, 9 to 25 percent slopes 20 SoE—Sulfy-Lowry silt loams, 9 to 25 percent slopes 20 SoE—Sulfy-Lowry silt loams, 9 to 25 percent slopes 20 SoE—Sulfy-Lowry silt loams, 9 to 25 percent slopes 20 SoE—Sulfy-Lowry silt loams, 9 to 25 percent slopes 20 SoE—Sulfy-Lowry silt loams, 9 to 25 percent slopes 20 SoE—Sulfy-Solamber complex, 9 to 25 percent slopes 20 SoE—Sulfy-Solamber complex 20 SoE	48
HoB—Hurley silt loams, 0 to 6 percent slopes 29 HsA—Hurley-Slickspots complex, 1 to 4 percent slopes 30  JbE—Java-Betts loams, 9 to 20 percent slopes 30  UaA—Uty silt loams, 9 to 25 percent slopes 30	49
HsA—Hurley-Slickspots complex, 1 to 4 percent slopes	49
slopes 30 slopes 30 JaA—Uly sift loams 0 to 2 percent slopes 30 UaA—Uly sift loam 0 to 2 percent slopes	40
JbE—Java-Betts loams, 9 to 20 percent slopes 30 UaA—Uty sitt loam, 0 to 2 percent slopes	CO
AND DATE OF THE PROPERTY OF TH	50
JgC—Java-Glenham loams, 6 to 9 percent slopes 32 UaB—Uly silt loam, 2 to 6 percent slopes	50
	51
Ko—Kolls silty clay	51
La—Lane silty clay loam 33 Wd—Wendte silty clay 33	51
CI—Lane-Parinsworth sit loams 33 We—Wendte sitty clay, channeled	52
LoA—Lowry silt loam, 0 to 2 percent slopes	52
LoB-Lowry silt loam, 2 to 6 percent slopes 34 Wp-Worthing silty clay loam, ponded	52

# Summary of Tables

Temperature and precipitation (table 1)	116
Freeze dates in spring and fall (table 2)	
Growing season (table 3)	118
Acreage and proportionate extent of the soils (table 4)	
Prime farmland (table 5)	120
and capability and yields per acre of crops and pasture (table 6)	
Rangeland productivity (table 7)	125
Range site name. Potential annual production for kind of growing season.	
Windbreaks and environmental plantings (table 8)	129
Recreational development (table 9)	136
Vildlife habitat (table 10)	142
Building site development (table 11)	
Shallow excavations. Dwellings without basements.  Dwellings with basements. Small commercial buildings.  Local roads and streets.	
Sanitary facilities (table 12)	152
Septic tank absorption fields. Sewage tagoon areas. Trench sanitary landfill, Area sanitary landfill, Daily cover for landfill.	
Construction materials (table 13)	159
Valer management (lable 14)	165
ngineering index properties (table 15)  Depth. USDA texture. Classification—Unified, AASHTO.  Fragments greater than 3 inches. Percentage passing sieve number—4, 10, 40, 200. Liquid limit. Plasticity index.	171

Physical and	chemical properties of the soils (table 16)	179
Soil and water	er leatures (table 17)	185
Engineering i	ndex test data (table 18)	190
Classification	of the soils (table 19)	191

### Foreword

This soil survey contains information that can be used in land-planning programs in Brule and Buffalo Counties, South Dakota. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

R. D. Swenson

State Conservationist

Soll Conservation Service

C. D. Lucison

# Soil Survey of Brule and Buffalo Counties, South Dakota

By Regis L. Viane, Soil Conservation Service

Soils surveyed by Karl J. Krueger, Wayne V. Vander Vorste, and Regis L. Via le, Soil Conservation Service, and Eugene E. Preston, South Dakota State University

United States Department of Agriculture, Soil Conservation Service, in cooperation with the United States Department of the Interior, Bureau of Indian Affairs, and the South Dakota Agricultural Experiment Station

BRJLE and BUFFALO COUNT ES are in the south-central part of South Dakota (fig. 1). They have a total area of 852.967 acres, or about 1,332 square miles, which includes about 30.803 acres of water. About 129,063 acres in Buffalo County is administered by the Bureau of Indian Affairs. Nearly all of this land is in the western part of the county. Fort Thompson is the agency headquarters of the Crow Creek Indian Reservation.



Figure 1.—Location of Brule and Buffalo Counties in South Dakots.

According to the 1980 census, Brule County has a population of 5,245 and Buffalo County one of 1,795 Chamberlain, the county seat of Brule County, has a population of 2,258. Gann Valley, the county seat of Buffalo County, is unincorporated. Other towns and villages in the survey area are 8 jou Hills, Fort Thompson. Kimball, and Pukwana.

About 51 percent of Brule County and 22 percent of Buffalo County are cultivated cropland and tame pasture and hay and (3). Most of the remaining acreage supports native grasses. Alfalfa, corn, oats, grain sorghum, spring wheat, and winter wheat are the main crops. Farming is diversified. Livestock is the main source of income, but income from cash crops also is important.

#### General Nature of the Survey Area

This section gives general information concerning the counties. It describes a mate; physiography, relief, and drainage; settlement; farming, and natural resources.

#### Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Brule and Buffalo Counties are usually quite warm in summer, but hot spells are frequent and cool days occasional. The counties are very cold in winter, when arctic air frequently surges over the area. Most precipitation falls during the warm period, and rainfail is heaviest rate in spring and early in summer. Winter

snowfat is normally not too heavy. It is blown into drifts, so that much of the ground is tree of snow.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Gann Valley and Chamberlain. South Dakota. Table 2 shows probable dates of the first freeze in fall and the tast freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 18 degrees F at Gann Valley and 22 degrees at Chambertain. The average daily minimum temperature is 7 degrees at Gann Valley and 11 degrees at Chambertain. The lowest temperature on record, which occurred at Gann Valley on January 15, 1972 is 35 degrees. In summer the average temperature is 72 degrees at Gann Valley and 75 degrees at Chambertain. The average daily maximum temperature is 88 degrees. The highest recorded temperature which occurred at Gann Valley on July 10, 1976, and at Chambertain on July 23, 1964, is 112 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in

The total annual precipitation is about 17 inches at Gann Valley and about 20 inches at Chamberlain Of this nearly 75 percent usually fails in April through September. The growing season for most crops falls within this period. The heaviest 1-day riunfalt during the period of record was 3.65 inches at Gann Valley on July 26, 1968, and 3.04 inches at Chamberlain on August 5, 1960. Thunderstorms occur on about 44 days each year, and most occur in summer. Hall fails in scattered small areas during some of these storms.

The average seasonal snowfall is about 25 inches. The greatest show depth at any one time during the period of record was 20 inches at Gann Valley and 31 inches at Chamberlain. On the average 40 days of the year have at least 1 inch of show on the ground. The number of such days values greatly from year to year. Blizzards occur several times each writer.

The average relative humidity in midalternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 55 percent in writter. The prevailing wind is from the south. Average windspeed is highest, 13 miles per hour in spring.

#### Physiography, Relief, and Drainage

Brule and Buffalo Counties are within the Coteau du Missouri division of the Missouri Plateau (4). The Coteau du Missouri consists of gently rolling and hilly end moraines of the Mankato Substage of the Wisconsin Glaciation and nearly level to undulating ground moraines. Much of the material deposited on the ground moraines is sifty glacial material. The steep trench of the Missouri River is along the western border of the counties. Most of the breaks along the river are clayey and are undertain by Pierre Shale. The flood plain along the Missouri River is inundated by Lake Francis Case and Lake Sharpe. The Bijou Hills are a prominent landmark in the southern part of Brule County. They occur as mesas that are 300 to 400 feet above the surrounding landscape and are capped by a thin layer of quartzitic sandstone. Below this cap rock is Pierre Shale.

American, Crow Eim Little Elm, Nelson, and Smith Creeks are the major drainageways. The creeks are intermittent and flow in the spring and after heavy rains Except for Nelson Creek, all the creeks drain into Lake Francis Case. Nelson Creek drains into Red Lake.

Elevation ranges from about 1,300 feet above sea level in the southwestern part of Brule County to about 2,100 feet in the Bijou Hills. The lowest elevation is along Lake Francis Case.

#### Settlement

The first permanent settlers in Brule County strived from lower in 1873. They settled in an area near the Missouri River where a town known as Brule City was founded. In 1875, further settlement was prohibited by executive order until 1879.

Brule County was established in 1875 (5) It was named after the Brule band of Teton Sloux who whabited the area it was reorganized in 1879, when settlement was again permitted. The first county seal was Brule City, which is now mundated by Lake Francis Case. The county seat was transferred to Chamberlain in 1880, after a vote by the county residents.

By 1890 Brule County had a population of 6.737. The population reached a peak of 7.416 in 1930. It declined to 6.076 by 1950 and 5.245 by 1980.

South Dakota State Highways 45 and 50 and Interstate Highway 90 are the main thoroughtares in Brule County. Most rural areas are served by all-weather roads to centers of trade. A small airport is at Chamberlain. Railroad transportation was extended into the county in the late 1800's. In 1905, the first railroad bridge was constructed across the Missouri River at Chamberlain.

The first permanent settlers in Buffalo County arrived in 1882. Phor to this date, fur traders and explorers frequently camped along the Missouri River and traded with the indians. The headquarters for the Crow Creek Indian Reservation was established at Fort Thompson in 1862.

The present boundaries of Buffalo County were established in 1885, the year the county was organized (6). At one time, Buffalo County was the largest county.

in the Dakota Territory. The western part of the county contains part of the Crow Creek Indian Reservation Gann Valley was selected as the county seat in 1888.

By 1890, Buffalo County had a population of 993. The population reached a peak of 1,931 in 1930. It declined to 1,547 by 1960 and rose to 1,795 by 1980.

South Dakota State Highways 34, 45, 47, and 50 are the main thoroughfares in Buffalo County. Many rural areas are served by poor roads. Big Bend Dam, constructed on the Missouri River in the early 1960's, impounds water that forms Lake Sharpe.

#### **Farming**

Farming is the principal enterprise in Brute and Buffalo Counties. About 64 percent of the farm income in the survey area is derived from the sale of Investock and Investock products (13). Most of the remainder of the farm income is derived from the sale of small green and corn. Some of the crops are used as feed for livestock.

in 1978, there were 455 farms in Brule County and 101 in Buffalo County. The farms average about 1,012 acres in size in Brule County and 3,148 acres in Buffalo County. The trend is lowerd fewer and larger farms in both counties.

About 51 percent of the acreage in Brule County is used for cultivated crops or for tame pasture and hay, and about 44 percent is range (3). In Buffalo County only about 22 percent of the acreage is used for cultivated crops or for tame pasture and hay, and about 75 percent is range. Dryland farming is dominant in both counties. About 8,000 acres, however, was irrigated in 1982 Nearly all imigation is by the spinitier method.

Wheat, corn, oats, and grain sorghum are the main cultivated crops. Alfalfs, intermediate wheatgrass, and smooth bromegrass are the main crops grown for hay in Brule County corn was grown on 41,700 acres in 1981, oats on 35,400 acres, sorghum on 20,000 acres, and wheat on 30,200 acres, for Buffalo County corn was grown on 6,200 acres, oats on 8,300 acres, sorghum on 10,000 acres, and wheat on 9,300 acres. The corn from 29,700 acres in Brule County and from 2,600 acres in Buffalo County was harvested for grain. The rest was used for silage.

The Brule-Buffalo Conservation District was organized in 1938 to help farmers control erosion problems. The district has been instrumental in planting trees on hundreds of acres since it was organized.

#### Natural Resources

Soil is the most important natural resource in the survey area. It provides a growing medium for crops and for the grass grazed by livestock. Other natural resources are water, wildlife, and sand and gravel.

take Francis Case and Lake Sharpe are excellent sources of water for domestic and industrial use and for imigation. Many small dams, dugouts, and flows of the larger creeks provide water for livestock in most parts of the counties. In Brule County the principal source of water for domestic use and for livestock is shallow wells. Because many areas in Buffalo County do not have a shallow source of water deep wells, drilled to a depth of 900 to 1,500 feet, are an additional source of water Water quantity generally is greater in the deep wells, but the quality is poor because of a high content of soluble salls.

Scattered deposits of sand and gravel are throughout the survey area. Because of an excessive amount of fine rock fragments, such as shale, chalk, and clay ironstone, the sand and gravel is unsuitable as concrete aggregate or as construction material. It is suitable, however, as subgrade material for roads and as bituminous aggregate.

Coyote, cottontail, red fox, whitetail deer, and upland game birds, such as gray partridge, grouse, and ring-necked pheasant, are the chief wildlife resources. The wellands, mainly in the southeastern part of the survey area, provide wetland wildlife production areas. In the spring and fall numerous species of ducks and geese migrate through the survey area. Base, bluegill, perch, and other fish inhabit most of the smaller bodies of water Lake Francis Case and Lake Sharpe provide excellent camping, fishing, and boating opportunities.

#### **How This Survey Was Made**

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness length, and shape of slopes, the general pattern of drainage; the kinds of crops and native plants growing on the soils, and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the tandscape. By observing the soils in the survey area and retaing their position to specific segments of the landscape a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the land of soil at a specific location on the landscape.

Commonly individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil landscape relationship are sufficient to verify predictions of the lands of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color texture size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of sort characteristics with precisely defined limits. The classes are used as a basis for companson to classify soks systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of honzons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

White a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and lests as wer as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses, interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and held experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soc

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific data.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

#### Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area. dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soits of a single taxonomic class rarely, if ever can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter sous are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar). inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas. and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that if was impractical to make enough observations to identify all of the kinds of socion the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

## General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soit map can be used to compare the suitability of large areas for general land uses. Areas of suitable soits can be identified on the map. Likewise, areas where the soits are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The 14 associations in this survey area have been grouped for broad interpretative purposes. The associations and the groups are described on the pages that follow. Because of changes or refinements in some senes concepts and differences in the design or extent of the map units, the names of the associations do not coincide exactly with those on the general soil maps in the published surveys of Aurora, Charles Mix, and Hand Counties. South Dakota.

#### Soll Descriptions

## Mearly Level to Rolling, Loamy Soils Underlain by Sand and Gravel; on Outwash Plains and Terraces

These sois dominantly are undulating to foling but are nearly level in places. They make up about 1 percent of the survey area. About 80 percent of the acreage is range. Conserving moisture and controlling erosion are the main management concerns.

#### 1. Cahe-Delmont Association

Well drained and somewhat excessively drained, nearly level to rolling loamy soils that are shallow or moderately deep over sand and gravel, on outwash plains and terraces

This association is on outwash plains and terraces. The slopes generally are undutating to rolling but are nearly level in places. In most places the drainage

pattern is well defined, but it is poorly defined in the nearly level areas.

This association makes up about 1 percent of the survey sree. It is about 30 percent Oahe soils, 30 percent Delmont soils, and 40 percent minor soils.

The well drained Oahe solls are on the smoother parts of the tandscape. Slopes range from 0 to 6 percent. Typically, the surface layer is dark grayish brown loam. The subsoil is dark grayish brown loam and clay loam. The upper part of the underlying material is grayish brown, calcareous loam. The lower part is multicofored, calcareous gravelly loamy sand.

The somewhat excessively drained Delmont soils are on ridges and knolls. Slopes range from 2 to 15 percent. Typically, the surface layer is dark grayish brown loam. The subsoil is dark gray, calcareous loam. The underlying material is multicolored, calcareous gravelly sand.

Minor in this association are the Bon, Duristein, Egas, Egas Variant, Farmsworth, and Ree soils. Except for the Ree soils, the minor soils are on narrow flood plains. Also soils are in positions on the landscape similar to those of the Oahe soils. The minor soils are not underlain by sandy and gravelly material.

About 80 percent of this association supports native grasses and is used for grazing or hay. Some areas are cultivated, Small grain and sorighum are the main crops. Conserving moisture and controlling erosion are the main concerns in managing the major soils for cultivated crops. This association is suited to range. The Oake soils and the gently sloping areas of the Delmont soils are suited to cultivated crops and to tame pasture and hay, but they are droughty.

#### Nearly Level to Steep, Silty and Loamy Soils on Uplands and in Upland Swales

These soils dominantly are nearly level to gently rolling but are steep in some areas. They make up about 59 percent of the survey area. About 64 percent of the acreage is cropland. Corn, oats, alialia, sorghum, and wheat are the main crops. Controlling erosion and conserving moisture are the main management concerns.

#### 2. Lowry-Sully Association

Deep, well drained, nearly level to steep, silty soils on

ublands

This association is on uplands characterized by smooth, nearly level to steep slopes. The drainage pattern is poorly defined in the nearly level areas and wall defined in the sleeper areas.

This association makes up about 4 percent of the survey area. It is about 50 percent Lowry and similar soils, 25 percent Sully soils, and 25 percent minor soils.

The cowry soils are on smooth side slopes and in nearly level areas. Slopes range from 0 to 15 percent. Typically the surface layer is gravish brown sit foam. The subsoil is grayish brown and brown sit foam. It is calcareous in the lower part. The underlying material is pale brown, calcareous sit foam and foam.

The Sully soits are in the steeper, more convex areas. Slopes range from 6 to 40 percent. Typically, the surface layer is grayish brown silt loam. The underlying material is brown and light yes owish brown, calcareous silt loam.

Minor in this association are the clayey Opal and Sansarc soils, which are undertain by shale, and the loamy Orton soils, which are undertain by gravelly material. Opal and Sansarc soils are on the steeper slopes generally below the Lowry and Sully soils on the landscape. Orton soils are in positions on the landscape similar to those of the Lowry soils.

About 60 percent of this association is cropland. Affalfa, come small grain, and sorghum are the main crops. Some areas are used for tame pasture and hay. The steeper more inaccessible areas support native grasses and are used for grazing. Conserving moisture and controlling erosion are the main concerns in managing cultivated areas. This association is suited to range, cultivated crops, and tame pasture and hay, but in some areas, the Sulty soils are too steep for cultivated crops.

#### 3. Uly Association

Deep, well drained, nearly level to moderately sloping, sity soils on uplands

This association is on uplands characterized by smooth slopes. The slopes generally are nearly level and gently sloping but are moderately sloping in places. In most areas the drainage pattern is well defined, but it is poorly defined in some of the nearly level areas.

This association makes up about 4 percent of the survey area. It is about 80 percent Uly and similar soils and 20 percent minor soils.

The Uty soils have a slope of 0 to 9 percent. Typically, the surface and subsurface layers are grayish brown sit toam. The subsoil is brown and pale brown sit toam. It is calcareous in the lower part. The underlying material is pale brown and very pale brown, calcareous sit toam.

Minor in this association are the McClure Mobindge, Plankinton, and Sully soils. McClure soils are underlain by clayey materia. They are in positions on the landscape similar to those of the Uty soils. The

moderately well drained Mobridge sorts are in swales. The poorly drained Plankinton sorts are in depressions. Suity soils are not so deep to time as the Uty soils. Also, they contain tess clay throughout. They are on the steeper parts of the landscape.

About 90 percent of this association is cropland Affetta, corn small grain, and sorghum are the main crops. Controlling erosion and consening moisture are the main concerns in managing the major soils for cultivated crops. This association is suited to cultivated crops, tame pasture and hay and range.

#### 4. Highmore-Mobridge Association

Open, well drained and moderately well drained, nearly level to gently rolling, sitly soils on uplands and in upland swales.

This association is on uplands characterized by gentle rises and many shallow swales. Slopes generally are nearly level to undulating but are gently rolling in some areas. The drainage pattern is poorly defined in areas where drainageways terminate in small depressions. A few scattered small stones are on the surface in some areas of the Highmore soils.

This association makes up about 14 percent of the survey area. It is about 40 percent Highmore soils, 20 percent Mobridge soils, and 40 percent minor soils (fig. 2).

The well drained Highmore soits are on the high parts of the landscape. Slopes typically are less than 4 percent but range from 0 to 9 percent. Typically, the surface layer is dark grayish brown slit loam. The subsoil is brown and light brownish gray sitty clay loam. It is calcareous in the lower part. The underlying material is pate yestow, light yellowish brown, and light gray, calcareous sit loam.

The moderately well drained Mobridge soils are in swales that are occasionally flooded. Slopes range from 0 to 3 percent. Typically, the surface and subsurface tayers are very dark grayish brown silt loam. The subsoil is dark grayish brown, and light brownish gray sifty clay loam. It is calcareous in the lower part. The underlying material is light yellowish brown, calcareous sifty clay loam.

Minor in this association are the DeGrey Eakin, Java, and Plankinton soils. The sodium affected DeGrey soils are on flats and in slightly concave areas. The sitty Eakin soils are 20 to 40 inches deep to loamy glacial titl. They are in positions on the landscape similar to those of the Highmore soils. The loamy Java soils are on knots and ridges. The poorty drained Plankinton soils are in depressions.

About 75 percent of this association is cropland. Alfalfa, com, small grain, and sorghum are the main crops. Conserving moisture and controlling erosion are the main concerns in managing the major soils for

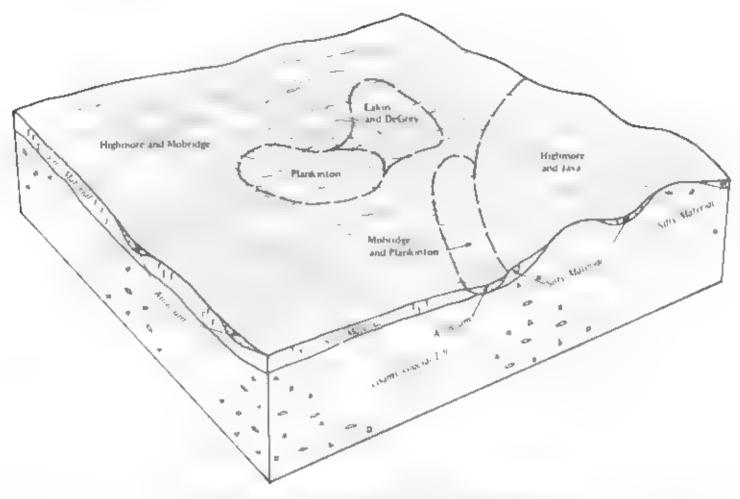


Figure 2.—Pettern of soils and perent resterial in the Highmore-Mobridge association.

cultivated crops. This association is suited to cultivated crops, tame pasture and hay, and range

#### 5. Highmore-Java-Glenham Association

Deep, well drained, nearly level to gently rolling, silty and loamy soils on uplands

This association is on uplands characterized by gentle rises swales and depressions. The drainage pattern is well defined in most areas but is poorly defined in those areas where the drainageways terminate in small depressions. Scattered stones are on the surface in some areas.

This association makes up about 24 percent of the survey area it is about 25 percent Highmore soils, 20 percent Java soils, 15 percent Glenham soils, and 40 percent other soils.

The Highmore soils are on smooth slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is dark grayish brown sit loam. The subsoil is dark brown.

and light yellowish brown sitty clay loam. It is calcareous in the lower part. The upper part of the underlying material is light yellowish brown calcareous sity clay loam. The lower part is brownish gray, calcareous clay loam.

The Java soils are on convex slopes in this association they have a slope of 2 to 9 percent. Typically, the surface layer is dark grayish brown calcareous loam. The subsoil is dark grayish brown and pale brown, calcareous loam. The underlying materia is pale brown and tight yellowish brown, calcareous loam, and clay loam.

The Glersham soils are on smooth and convex slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is dark grayish brown loam. The subsoil is dark grayish brown brown, and light brownish gray day loam. It is calcareous in the lower part. The underlying material is light brownish gray, calcareous clay loam.

Minor in this association are the Bon. DeGrey, Defmont, Durrstein, Farmsworth, Jerauld, Lane, Mobridge and Plankinton soits Bon. Durrstein and Farmsworth soits are on flood plains. DeGrey and Jerauld soits are in small depressions in the uplands. Delmont and Lane soits are on terraces. Bon soits are stratified and are dark to a depth of more than 20 inches. DeGrey. Durrstein, Farmsworth, and Jerauld soils have a sodium affected subsoil. Delmont soils are undertain by gravelly material. Lane soils contain more clay in the subsoil than the major soils. The moderately well drained Mobridge soits are in swales. The poorly drained Plankinton soils are in depressions.

About 55 percent of this association is croptand Alfa-la com small grain and sorghum are the main crops. Conserving moisture, maintaining fertility, and controlling erosion are the main concerns in managing the cultivated areas. The major soils are suited to cultivated crops, tame pasture and hay, and range.

#### 6. Eakin-DeGrey Association

Deep, well drained and moderately well drained, nearly

level and gently undulating, sitty soils on uplands

This association is on uplands characterized by gentle rises, slight swales, and depressions. In most areas the drainage pattern is poorly defined, but it is well defined along the larger drainageways. Scattered stones are on the surface in most areas.

This association makes up about 13 percent of the survey area. It is about 30 percent Eakin soils, 25 percent DeGrey soils, and 45 percent minor soils (fig. 3)

The well drained Eakin soils are on slight rises. Slopes range from 0 to 3 percent. Typically, the surface layer is dark grayish brown sill loam. The subsoil is dark grayish brown, grayish brown, and light yellowish brown silly clay loam and sill loam. It is calcareous in the lower part. The underlying material is grayish brown, calcareous clay loam.

The moderately well dramed, sodium affected DeGray sods are in smooth or slightly concave areas. Slopes range from 0 to 3 percent. Typically, the surface layer is dark grayish brown slit loam. The subsurface layer is

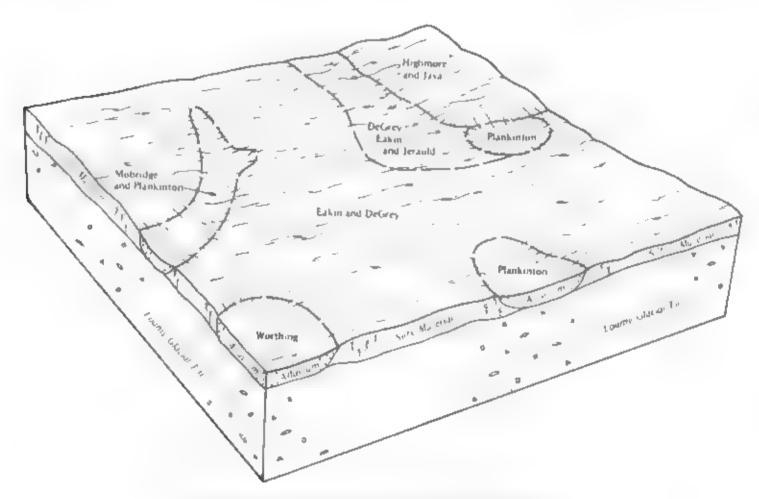


Figure 3.—Pattern of soils and parent material in the Eakin-DeGrey association.

grayish brown silt loam. The subsoit is dark grayish brown and grayish brown silty diay and silty diay loam. It is calcareous in the lower part. The underlying material is pale brown and light brownish gray, calcareous silty diay loam, and clay loam.

Minor in this association are the Highmore Java. Jerauld Mobridge Plankinton, and Worthing soits Highmore soils are more than 40 inches deep to loamly gracial till. They are in positions on the landscape similar to those of the Eakin soils. The loamly Java soits are on the highest and side slopes along drainageways. The sodium affected Jerauld soils are in small pits and depressions. Mobridge soils are dark to a depth of more than 20 inches. They are in swales. The poorly drained Plankinton and very poorly drained Worthing soils are in depressions.

About 60 percent of this association is cropland Alfalia, com, small grain, and sorghum are the main crops. Conserving moisture and improving tith are the main concerns in managing cultivated areas. The major soils are suited to cultivated crops, tame pasture and hay and range, but the sodium affected subsoil in the DeGrey soils is a limitation.

#### Level to Gently Rolling, Loamy and Silty Soils on Uplands and in Upland Depressions

These soils dominantly are undulating and gently rolling but are level or nearly level in some areas. They make up about 10 percent of the survey area. About 55 percent of the acreage supports native grasses and is used for grazing or hay. Corn loats, alfalfa, and sorghum are the main crops. Controlling erosion is the main management concern.

#### 7. Beadle-Plankinton-Eakin Association

Deep well drained and poorly drained level to gently rolling, loamy and silty soils on uplands and in upland depressions.

This association is on uplands characterized by many scattered depressions. The drainage pattern is poorly defined, and most of the runoff accumulates in closed depressions. Scattered stones commonly are on the surface.

This association makes up about 2 percent of the survey area. It is about 30 percent Beadle soits, 20 percent Plankinton and similar soils, 15 percent Eakin soils, and 35 percent minor soils.

The well drained Beadie soils are on side slopes. Slopes range from 1 to 9 percent. Typically, the surface layer is dark gray loam. The subsoil is dark grayish brown and grayish brown clay loam. It is calcareous in the lower part. The underlying material is light brownish gray, calcareous clay loam.

The poorly drained Plankinton soils are in depressions. Slopes are less than 1 percent. Typically, the surface layer is dark gray sift loam. The subsurface layer is gray sift loam. The subsoil is dark gray sifty clay. The

underlying material is grayish brown calcareous silty clay and silty clay loam.

The well drained Eakin soils generally are on the high parts of the landscape. Slopes range from 0 to 3 percent. Typically, the surface layer is dark grayish brown, sift loam. The subsoil is dark grayish brown, grayish brown, ight yellowish brown sifty clay loam and sift loam. It is calcareous in the lower part. The underlying material is grayish brown, calcareous clay loam.

Minor in this association are the DeGrey Java, Jerauld, and Mobridge soils. The sodium affected DeGrey and Jerauld soils are in small pits and depressions. The calcareous Java soils are on some indges and knolls. The moderately well drained Mobridge soils are in swates.

About 75 percent of this association supports native grasses and is used for grazing or hay. Some areas are used for cultivated crops or for tame pasture and hay. Controlling erosion on the Beadle soils and controlling welness on the Plankinton soils are the main management concerns in cultivated areas. This association is suited to range cultivated crops, and teme pasture and hay. The numerous depressions are potential sites for stock water impoundments.

#### 8. Glenham-Java-Highmore Association

Deep well drained, nearly level to gently rolling, loamy and sifty soils on uplands

This association is on uplands that are characterized by numerous swales and depressions. The drainage pattern is well defined in most areas but it is poorly defined in those areas where drainageways terminate in small depressions. Scattered stones commonly are on the surface

This association makes up about 8 percent of the survey area. It is about 30 percent Gienham soits. 20 percent Java soils. 15 percent Highmore soils, and 35 percent minor soils.

The Glenham soils are on smooth and convex slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is dark grayish brown loam. The subsoil is dark grayish brown, brown, and light brownish gray cay loam. It is calcareous in the lower part. The underlying material is light brownish gray, calcareous day loam.

The Java soils are on convex slopes in this association they have a slope of 2 to 9 percent. Typically the surface layer is dark grayish brown, calcareous loam. The subsoil is dark grayish brown and pale brown, calcareous loam. The underlying material is pale brown and light yellowish brown, calcareous loam, and clay loam.

The Highmore soils are on smooth slopes. Slopes range from 0 to 9 percent. Typically the surface layer is dark grayish brown silt loam. The subsoil is dark brown and light yellowish brown silty clay loam. It is calcareous

in the lower part. The upper part of the underlying material is light yellowish brown, calcareous sity clay loam. The lower part is light brownish gray, calcareous

clay loam.

Minor in this association are the DeGrey, Delmont. Jerauld, Plankinton, Schamber, and Worthing soils. DeGrey and Jerauld soils have a sodium affected subsoil. They are in small pits and depressions in the uplands. Delmont and Schamber soils are undertain by gravelly material. They are on terraces. The poorty drained Planlonton and very poorty drained Worthing soils are in depressions.

About 50 percent of this association is cropland Alfalia com small grain and sorghum are the main crops. Conserving moisture, maintaining fertility, and controlling erosion are the main concerns in managing the cultivated areas. The major soits are suited to cultivated crops, tame pasture and hay, and range.

#### Level, Sitty Soils on Flood Plains

These sois make up about 1 percent of the survey area. About 95 percent of the acreage is range

#### 9. Durrstein-Egas Association

Deep, poorly drained, level, sifty soils on flood plains

This association is on the flood plains along some of the larger drainageways. It generally is dissected by meandering channels. The drainage pattern is poorly defined in all areas, except for those near the channels.

This association makes up about 1 percent of the survey area. It is about 45 percent Duristein soils, 45 percent Egas soils, and 10 percent minor soils.

The Durratein soils are on broad flats. Slopes are less than 1 percent. Typically, the surface layer is gray sitt loam. The subsoil is dark gray and gray sitty clay. It is calcareous in the lower part. The underlying material is gray, calcareous sitty clay. It has accumulations of carbonate and nests of gypsum and other salts throughout.

The Egas soils are on broad flats. Slopes are less than 1 percent. Typically the surface layer is gray sifty clay loam. The subsurface layer is dark gray sifty clay. The next layer is dark gray calcareous sifty clay. The underlying material is gray and light gray calcareous sifty clay and clay loam. In most places visible salts are within

a few inches of the surface

Minor in this association are the Bon Delmont, Farmsworth, Lane. Oahe and Ree soits Bon. Delmont, Lane, Oahe, and Ree soits do not have an accumulation of visible saits. Also, Delmont and Oahe soits are underlain try gravely material Delmont, Oahe, and Ree soits are on terraces. The somewhat poorly drained Farmsworth soits and the Bon and Lane soils are slightly higher on the flood plains than the Durrstein soits.

About 95 percent of this association supports riative grasses and is used for grazing or hay. Measures that prevent overgrazing are the main management needs. This association is suited to range. The major soils generally are unsuited to cultivated crops and to tame pasture and hay because of the satinity and flooding.

#### Gently Sioping to Steep, Clayey and Loamy Solis on Uplands

These soils dominantly are strongly sloping to steep but are less sloping in places. They make up about 15 percent of the survey area. About 92 percent of the acreage is range.

#### 10. Betts-Java Association

Deep well drained, strongly sloping to sleep, loamy soils on uplands

This association dominantly is on indges, hills, and the sides of drainageways. Slopes dominantly are strongly sloping or moderately steep but are steep in some areas. The drainage pattern is well defined.

This association makes up about 1 percent of the survey area it is about 35 percent Betts soils, 30 percent Java soils, and 35 percent minor soils.

The Betts soils are on hidges knotts and the upper side slopes. Slopes range from 9 to 40 percent. Typically the surface layer is dark grayish brown, calcareous foam. The next layer is light brownish gray calcareous clay loam. The underlying material is grayish brown and light yellowish brown calcareous clay loam.

The Java soils are on side slopes. In this association they have a slope of 9 to 25 percent. Typically, the surface tayer is dark grayish brown, calcareous loam. The subsoil is dark grayish brown and pale brown calcareous loam. The underlying material is pale brown, and light yellowish brown, calcareous loam, and clay loam.

Minor in this association are the Bon, Glenham. Ree and Schamber soils. Bon soils are stratified and are dark to a depth of more than 20 inches. They are on flood plains. Glenham and Ree soils are more than 10 inches deep to time. Glenham soils are on the lower side slopes. Ree soils are on terraces. The excessively drained Schamber soils are on some indees.

Nearly all of this association supports native grasses and is used for grazing. Controlling erosion and runoff is the main concern of management. This association is suited to range. It generally is unsuited to cultivated crops and to tame pasture and hay. Many areas are potential artes for stock water impoundments.

#### 11. Sensare-Opel-Chantier Association

Shallow and moderately deep, well drained, gently sloping to steep, clayery soils on uplands

This association is on uplande characterized by sleep slopes and deeply entrenched drainageways. The soils generally are strongly sloping to steep but are less stoping on some side slopes. The drainage pattern is well defined.

This association makes up about 13 percent of the survey area it is about 30 percent Sensarc soils, 25 percent Opal soils, 15 percent Chantier soils, and 30 percent minor soils (fig. 4).

The shallow Sansarc soils are on knolls and noges. Slopes range from 6 to 40 percent. Typically, the surface layer is grayish brown clay. The underlying material is light brownish gray calcareous day and very shally day Light gray shalle bedrock is at a depth of about 15 inches.

The moderately deep Opal soits generally are on the lower side slopes. In this association they have a slope of 2 to 25 percent. Typically, the surface layer is gray

clay. The subsoil is grayish brown clay. It is calcareous in the lower part. The underlying material is light brownish gray calcareous clay. It has accumulations of carbonate throughout, Light gray shall bedrock is at a depth of about 37 inches.

The shallow Chantier soils generally are on the less stoping parts of the landscape. Slopes range from 2 to 15 percent. Typically, the surface layer and the subsoil are grayish brown, calcareous clay. The underlying material is grayish brown, calcareous shally clay. It has accumulations of time and visible saits throughout light brownish gray calcareous shalle bedrock is at a depth of about 17 inches.

Minor in this association are the Betts Bullcreek, Gettys, Java, McClure, Promise Sully Uty and Wendle

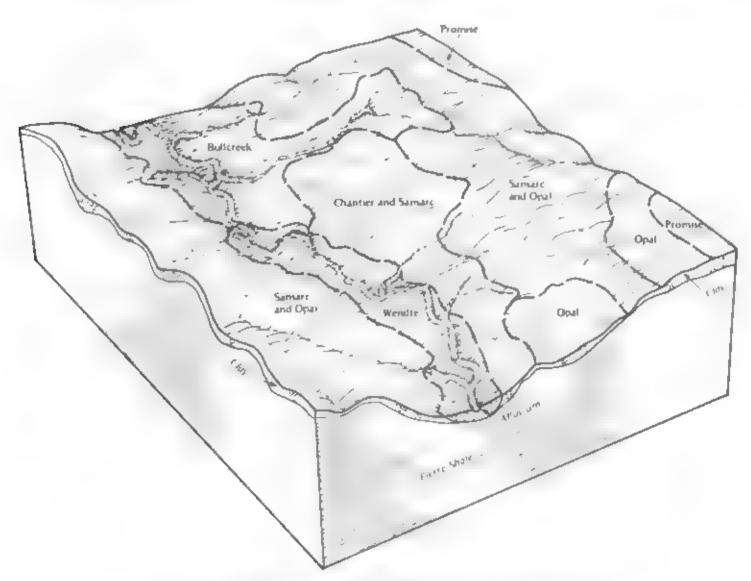


Figure 4.—Pattern of softs and parent muturial in the Canastro-Opal-Chantler association.

soils The deep loamy Betts Gettys, and Java soils and the deep silty McClure Sulty and Uty soils are above the major soils on the landscape. The deep clayey Buildreak and Promise soils are on the lower less stoping parts of the landscape. The stratified Wendte soils are on the narrow food plains.

About 95 percent of this association supports native grasses and is used for grazing. Native hay is harvested in some areas. Controlling erosion and runoff is the main concern of management. This association is suited to range. It generally is unsuited to cultivated crops and to tame pasture and hay. Because of the slope and the unstable nature of the shale landslides are common in the steeper areas.

#### 12. Okaton Association

Shallow, well drained, moderately steep and steep, clayey soils on uplands

This association consists primarily of the area known as the Bilou Hills in the southern part of Brufe County. The slopes generally are steep but are moderately sleep in places. The drainage pattern is well defined.

This association makes up about 1 percent of the survey area it is about 55 percent Okaton soils and 45 percent minor soils.

The Okalon soils have a slope of 15 to 40 percent. Typically the surface layer is grayish brown, calcareous bouldery sifty clay. The next layer is grayish brown and light ye lowish brown, calcareous bouldery sifty clay. The underlying materia, is light yellowish brown and light olive brown clay and shally clay. Light brownish gray and pale yellow calcareous shale bedrock is at a depth of about 16 inches.

Minor in this association are the Millboro Opal, Plankinton. Ree and Uly soils. The deep Millboro and moderately deep Opal soils are on the lower less sloping parts of the landscape. The deep loamy Ree soils and the deep sitty Uly soils are on the top of buttes. The poorty drained Plankinton soils are in depressions.

About 75 percent of this association supports native grasses and is used for grazing, however many of the minor soils are cultivated or used for tame pasture and hay Controlling erosion and runoff is the main concern of management. This association is suited to range, it generally is unsuited to cultivated crops and to tame pasture and hay because of the slope, boulders, and shallow depth to shale.

#### Nearly Level to Strongly Sloping, Clayey Soils on Uplands

These soils dominantly are gently sloping and moderately sloping but are nearly level in some areas and strongly sloping in others. They make up about 14 percent of the survey area. About 60 percent of the

acreage is range. Small grain, sorghum, and alfalfa are the main cultivated crops.

#### 13. Opal, saline-Promise Association

Moderately deep and deep, well drained, nearly level to strongly sloping, clayey soils that are dominantly saline; on uplands

This association is on uplands characterized by smooth slopes. The soils generally are nearly level and undulating but are moderately sloping and strongly sloping in some areas. The drainage pattern is well defined.

This association makes up about 6 percent of the survey area it is about 60 percent Opai soils, 30 percent Promise soils and 10 percent minor soils.

The moderately deep saline Opai soils are on convex slopes. In this association they have a slope of 1 to 11 percent. Typically the surface layer is dark grayish brown clay. The subsoil is dark grayish brown clay. In the lower part it is calcareous and has accumulations of salts. The underlying material is light brownish gray mottled, calcareous clay. It has accumulations of lime throughout Light gray.

The deep Promise soils generally are on gentle slopes. Slopes range from 0 to 6 percent. Typically the surface layer is dark gray sitty clay. The subsoil is dark grayish brown and grayish brown clay. It is calcareous in the lower part. The underlying material is grayish brown and light brownish gray, calcareous clay.

Minor in this association are the moderately well drained Carter and Wendte soits and the shallow Sansarc soits Carter soits are on flats. Sansarc soils are on the steeper parts of the landscape. Wendte soils are on narrow flood plains.

Most of this association supports native grasses and is used for grazing or hay. Some areas are used for attaita, wheat, and sorghum. Conserving moisture, controlling erosion, and improving tilth are the main concerns in managing cultivated areas. This association is suited to range, cultivated crops, and tame pasture and hay.

#### 14. Promise-Opal Association

Deep and moderately deep well drained, nearly level to strongly sloping, clayey soils on uplands

This association is on uplands characterized by long, smooth slopes. The soils generally are nearly level and gently sloping but are strongly sloping in some areas. The dramage pattern is well defined.

This association makes up about 8 percent of the survey area. It is about 50 percent Promise soils, 30 percent Opal soils, and 20 percent minor soils.

The deep Promise soils generally are on flats and gentle slopes. Slopes range from 0 to 6 percent. Typically, the surface layer is dark gray skily clay. The

subsoil is dark grayish brown and grayish brown clay it is calcareous in the lower part. The underlying material is grayish brown and light brownish gray calcareous clay

The moderately deep Opal soils are on convex slopes. In this association they have a slope of 6 to 11 percent. Typically the surface layer is gray silty clay. The subsoil is grayish brown clay. It is calcareous in the lower part. The underlying material is light brownish gray calcareous clay Light gray shale bedrock is at a depth of about 37 inches.

Minor in this association are the moderately well drained Carter and Wendte soils, the sodium affected Hurley soils, the poorly drained Kolls soils, and the

shallow Senserc soils. Carter and Hurley soils are on flats. Kolls soils are in depressions. Sansarc soils are on the steeper parts of the landscape. Wendte soils are on narrow flood plants.

About 60 percent of this association is used for cultivated crops and tame pasture and hay Affalfa, sorghum and wheat are the main crops but some corn also is grown. Some areas support native grasses and are used for grazing or hay. Conserving moisture controlling erosion, and improving tilth are the main concerns in managing cultivated areas. This association is suited to range, tame pasture and hay, and cultivated crops.

## **Detailed Soil Map Units**

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section along with the soil maps can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a soil series. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can drifer in texture of the surface layer or of the underlying material. They also can drifer in slope stoniness, sainly wetness degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example Gienham loam, 0 to 3 percent slopes, is one of several phases in the Glenham series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A soil complex consists of two or more soils or one or more soils and a miscellaneous area in such an introcate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Carter-Promise complex is an example.

Most map units include small scattered areas of sods other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some

small areas of strongly contrasting sods are identified by a special symbol on the soil maps.

The names of some map units identified on the detailed soil maps of this survey area do not fully agree with those identified on the maps in the published surveys of Aurora. Charles Mix and Hand Counties. South Dakota. Differences are the result of variations in the design and composition of map units or changes and refinements in series concepts.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see Summary of Tables.) give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

#### Soil Descriptions

Ar—Artesian slity clay loam. This deep somewhat poorly drained level soil is in basins adjacent to Reduke It is subject to rare flooding. Areas are 50 to 150 acres in size and are irregular in shape. Slopes are long and smooth

Typically, the surface layer is dark gray sity clay loam about 5 inches thick. The subsoil is dark gray and gray, mottled, very firm sity clay about 26 inches thick. In the lower part it is calcareous and has accumulations of lime and saits. The underlying material to a depth of 60 inches is light brownish gray, mottled calcareous sity clay and sity clay loam. If has nests of saits in the upper part and has accumulations of carbonate throughout. In places the surface tayer is sity clay.

Included with this soil in mapping are small areas of Bon and Worthing soils. These soils make up less than 20 percent of any one mapped area. The moderately well drained Bon soils are on the slightly higher parts of the tandscape near the edge of the mapped areas. The very poorly drained Worthing soils are in depressions.

Fertility and the content of organic matter are high in the Artesian soil. Tith is poor. Available water capacity is moderate or high. Permeability is slow. A seasonal high water table is at a depth of 3 to 6 feet. Runoff is slow. The shrink-swell potential is very high.

About half of the acreage is cropland. This soil is suited to cultivated crops. Measures that improve tilth increase the rate of water intake, and conserve moisture are the main management needs. Examples are leaving crop residue on the surface and including grasses and

legumes in the cropping system. Chiseling and subsoiling help to break up the dense subsoil and thus increase the rate of water intake. The wetness caused by flooding and the seasonal high water table delays fieldwork in some years. Surface drains help to remove excess water after heavy rains.

This soil is suited to tame pasture and hay Alfalfa, Gamson creeping foxtail, intermediate wheatgrass, and smooth bromegrass are suitable pasture plants. The surface soil compacts and the grass stands deteriorate if the pasture is grazed when wet. Deferred grazing during wet periods helps to prevent pudding.

If this soil is used for range, compaction is a problem. Restricted grazing during well periods helps to prevent surface compaction and detenoration of tilth. Many areas are potential sites for excavated bonds.

This suit is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. Those that require an abundant moisture supply grow especially well.

The capability unit is Illw-3; Subringated range site

BeB Beadle loam, 2 to 6 percent slopes. This deep, well drained, undulating so is on uplands in places scattered stones are on the surface and throughout the soil. Areas are 20 to several hundred acres in size and are irregular in shape. Slopes are short and convex

Typically, the surface layer is dark gray loam about 6 mohes thick. The subsoil is dark grayish brown and grayish brown, firm clay loam about 17 inches thick. In the lower part it is calcareous and mottled and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, mottled, calcareous clay loam. In some areas the depth to lime is less than 12 inches in other areas the subsoil contains less clay. In places the surface layer is silt loam.

Included with this soil in mapping are small areas of DeGrey Eakin. Highmore Jerauld, and Mobridge soils. These soils make up less than 20 percent of any one mapped area. DeGrey and Jerauld soils have a sodium affected subsoil. They are in small pits and depressions. Eakin and Highmore soils contain less clay and sand in the subsoil than the Beadle soil. They are on the smooth parts of the landscape. The moderately well drained Mobridge soils are in swales.

Fertility is medium and the content of organic matter moderate in the Beadle soil. Tilth is fair. Available water capacity is high. Permeability is moderately slow. Runoff is medium. The shrink-swell potential is high in the subsoil.

About half of the acreage is cropland. This soit is suited to cultivated crops and to tame pasture and hey Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture, help to control

erosion and improve tilth are the main management needs in cultivated areas. Examples are minimizing tillage leaving crop residue on the surface and including grasses and legumes in the cropping system. Chiseking and subsoiling improve tilth and increase the rate of water intake. Contour farming grassed waterways and terraces help to control water erosion, but the slopes in some areas are too short or too irregular for contouring and terracing.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely determent of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. It takes in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is life-3; Clayey range site

BeC—Beadle loam, 5 to 9 percent slopes. This deep, well drained, gently rolling soil is on uplands. In places scattered stones are on the surface and throughout the soil. Areas are 10 to 200 acres in size and are irregular in shape. Slopes are mostly convex.

Typically the surface layer is dark gray loam about 6 inches thick. The subsoil is dark grayish brown and grayish brown firm clay loam about 17 inches thick in the ower part it is calcareous and motted and has accumulations of time that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, mottled, calcareous clay loam. In places the depth to lime is less than 12 inches. In some places the subsoil contains less day in other places the surface layer is silt loam.

Included with this soil in mapping are small areas of DeGrey Faxin, Highmore, Jerauld, and Mobridge soils These soils make upliess than 25 percent of any one mapped area. DeGrey and Jerauld soils have a sodium affected subsoit. They are in small pits and depressions Faxin and Highmore soils contain less clay and sand in the subsoil than the Beadle soil. They are on the smooth parts of the landscape. The moderatery well drained Mobridge soils are in swales.

Fertitity is medium and the content of organic matter moderate in the Beadle soil. Tilth is fair. Available water capacity is high. Permeability is moderately slow. Runoff is medium. The shrink-swell potential is high in the subsoil.

Most of the acreage supports native grasses and is used for grazing and hay. No major hazards or limitations affect the use of this soil for range. Water erosion is a hazard however if the range is overgrazed. Guites form along some cattle trains. Fencing and other means of controlling investock traffic patterns help to prevent the formation of guilles.

This soil is suited to cultivated crops and to tame pasture and hay Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that help to control erosion and improve titth are the main management needs in cultivated areas. Examples are leaving crop residue on the surface minimizing triage and including grasses and legumes in the cropping system. Chiseling and subsolving improve titth and increase the rate of water intake. Contour farming, grassed waterways, and terraces help to control water erosion, but the slopes in some areas are too short or too irregular for contouring and terracing.

This soil is suited to windbreaks and environmental plantings. It takes in water slowly however and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IVe 7 Clayey range site

BgB—Beadle-Jerauld complex, 1 to 5 percent slopes. These deep gently sloping and undulating soils are on uplands. The well drained Beadle soil is on convex slopes. In places a lew scattered stones and small glacial boulders are on the surface. The somewhat poorly drained Jerauld soil is on side slopes and in swales. Areas are i0 to more than 200 acres in size and are irregular in shape. They are 45 to 55 percent Beadle soil and 20 to 30 percent Jerauld soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically the surface layer of the Beadle soil is dark gray loam about 6 inches thick. The subsoil is dark grayish brown and grayish brown firm clay loam about 17 inches thick. In the lower part if is calcareous and mottled and has accumulations of time that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray mottled, calcareous clay loam. In some areas the depth to lime is less than 12 inches in other areas the subsoil contains less clay. In places the surface layer is sit loam.

Typically the surface layer of the Jerauld soil is grayish brown silt loam about 2 miches thick. The subsoil is dark grayish brown, dark gray and grayish brown, very firm and firm day loam about 2 inches thick. It is calcareous and has visible sails and accumulations of lime in the lower part. The underlying material to a depth of 60 inches is grayish brown, light brownish gray, and light yellowish brown, calcareous clay loam. It has visible sails in the upper part. It is mottled in the lower part, it has accumulations of lime throughout.

Included with these soils in mapping are small areas of DeGrey, Eakin Highmore Mobindge and Plankinton soils. These included soils make upliess than 25 percent of any one mapped area. DeGrey soils have visible salts below a depth of 16 inches. They are on low mounds. The silty Eakin and Highmore soils do not have a sodium.

affected subson. They are in positions on the landscape similar to those of the Beadle soil. The moderately well drained Mobridge soils are in swales. The poorly drained Plantimon soils are in depressions.

Fertility is medium and the content of organic matter moderate in the Beadle soil. Fertility and the content of the organic matter are low in the perauld soil. The Jerauld soil has a sodium affected subsoil. Tith is fair in the Beadle soil and poor in the Jerauld soil. Available water capacity is high in the Beadle soil and low or moderate in the perauld soil. Permeability is moderately slow in the Beadle soil and slow in the Jerauld soil. Runoff is medium on the Beadle soil and slow on the perauld soil. The shrink swell potential is high in the subsoil of both soils.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction is a problem in areas of the uerauid soil. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of bith.

This map unit is suited to tame pasture and hay but very little production can be expected on the uerauld soil. Affalfa, crested wheatgrass, intermediate wheatgrass, and smooth bromegrass are suitable pasture plants for the Beadle soil. No pasture plants grow well on the Jerauld soil because the sodium affected subsoil restricts root development.

These sons are suited to cultivated crops but crop growth is severely restricted on the Jerauid soil Because the Jerauid soil occurs in a random pattern throughout the map unit it is cropped with the Beadle soi. The dense claypan subsoil near the surface and the saits in the subsoil severely restrict root penetration and the rate of water intake in the Jerauid soil. Tilling when the soils are wet causes compaction of the subsoil. Measures that improve tilth, conserve moisture, and control erosion are the main management needs. Examples are minimizing tillage, applying animal manure, leaving crop residue on the surface, and including grasses and legumes in the cropping system. Subsoiling or chiseling improves tilth, and increases the rate of water intake for a short time.

The Beadle soil is suited to windbreaks and environmental prantings, but it takes in water slowly and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established on the Beadle sok, but optimum growth is unlikely. The Jerauid soil generally is unsuited to windbreaks and environmental plantings. No trees or shrubs grow well on this soil.

The Beadle soil is in capability unit 0 e-3. Clayey range site, the uerauid soil is in capability unit VIs-1. This Claypan range site.

BmF—Betts-Java loams, 20 to 40 percent slopes. These deep well drained moderately steep and steep sons are on uplands that generally are dissected by small drainageways. The Betts soil is on highest and the upper side slopes. The Java soil is on the less sloping.

lower side slopes. Areas are 80 to several hundred acres in size and irregular in shape. They are 40 to 50 percent Betts soil and 30 to 40 percent Java soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical. In most areas scattered glacial boulders and stones are on the surface and throughout the soils.

Typically the surface layer of the Betts soil is dark grayish brown calcareous loam about 3 inches thick. The next layer is light brownish gray finable calcareous day loam about 5 inches thick. The underlying material to a depth of 60 inches is grayish brown and light yellowish brown calcareous clay loam. Accumulations of time are throughout the transitional layer and upper part of the underlying material. Nests of gypsum and mottles are in the lower part. In places the soil contains more clay throughout.

Typically, the surface layer of the Javn soil is dark grayish brown, calcareous loam about 4 inches thick. The subsoil is dark grayish brown and pale brown. friable calcareous loam about 14 inches thick in the lower part it has accumulations of lime that extend into the underlying materia. The underlying material to a depth of 60 inches is paie brown and light yellowish brown calcareous loam and clay loam.

Included with these soils in mapping are small areas of Bon Grenham Okaton. Sansarc Schamber and Sully soils. These included soils make up less than 25 percent of any one mapped area. The moderately well drained Bon soils are on narrow flood plains. Glenham soils are more than 14 inches deep to lime. They are on the gently sioping parts of the tandscape. The clayey Okaton and Sansarc soils are undertain by shale within a depth of 20 inches. They are lower on the tandscape than the Betts and Java soils. Schamber soils are on knolls and indges. They are less than 10 inches deep to gravely material. Sury soils formed in sity loess. They are on some of the upper slopes along the Missoun River.

Fertility and the content of organic matter are low in the Belts and Java soils. Available water capacity is high. Permeability is moderate in the upper part of the profile and moderately slow in the underlying material. Bunch is rapid. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing or hay. These moderately steep and steep soils are subject to water erosion unless an adequate plant cover is maintained. Reestablishing vegetation is difficult in denuded areas. Many areas in the deeper draws are suitable sites for stock water amountments.

These soils generally are too steep for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The Betts soil is in capability unit Vile-3, Thin Upland range site; the Java soil is in capability unit Vie-3, Sity range site:

Bn—Bon loam. This deep well drained, nearly level soil is on flood plains. It is subject to rare flooding for binel periods. Areas are 15 to 160 acres in size and are megular in shape. Slopes are long and smooth

Typically the surface layer is dark grayish brown loam about 14 inches thick. The subsurface layer is grayish brown and dark gray very fnable calcareous loam about 14 inches thick. It has accumulations of time throughout. The underlying material to a depth of 60 inches is pale brown and light brownish gray stratified, calcareous clay loam and silty clay loam, in places the subsurface layer is not so dark.

Included with this soil in mapping are small areas of Durrstein. Egas Farmsworth, Lane Oahe and Ree soils. These soils make up less than 20 percent of any one mapped area. The poorly drained Durrstein and Egas soils are on the low parts of the flood plains. Farmsworth and Lane soils are in positions on the landscape similar to those of the Bon soils. Farmsworth soils have a sodium affected subsoil. Lane soils contain more clay in the control section than the Bon soil. Oahe and Ree soils are on terraces. Oahe soils are underlain by gravelly material at a depth of 20 to 40 inches. Ree soils are dark to a depth of less than 20 inches.

Femility and the content of organic matter are high in the Bon soil. Tith is good. Available water capacity is high. Permeability is moderate. Runoff is slow.

About half of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture during dry periods are the main management needs in cultivated areas. Examples are leaving crop residue on the suitace and including grasses and regumes in the cropping system. Floodwater delays planting in some years, but in most years the additional moisture is beneficial and flood damage is minor.

No major hazards or limitations affect the use of this soil for range. Although the soil is subject to brief flooding, the additional moisture is beneficial.

This soil is suited to windbreaks and environmental plantings. The trees and shrubs that require an abundant supply of moisture grow especially well.

The capability unit is IIc-3, Overflow range site

Bo—Bon loam, channeled. This deep moderately well drained and well drained nearly level soil is on flood plains that are dissected into many small tracts by narrow channels and partly filled old stream meanders. The soil is occasionally interest adjacent to the channel and a subject to rare flooding on the high parts of the flood plain. Areas are 15 to more than 100 acres in size and are long and narrow.

Typically the surface layer is dark grayish brown loam about 14 inches thick. The subsurface layer is grayish brown and dark gray, very fnable, calcareous loam about

14 inches thick it has accumulations of time throughout. The underlying material to a depth of 60 inches is pale brown and light brownish gray, stratified, calcareous day loam and sitty clay loam.

included with this soil in mapping are small areas of Oahe Ree and Wendte sons. These soils make upless than 20 percent of any one mapped area. The well-drained Oahe and Ree soils are underlain by gravelly material at a depth of 20 to 40 inches. Ree soils are dark to a depth of less than 20 inches. Wendte soils contain more day throughout than the Bon soils. They are in positions on the landscape similar to those of the Bon soil.

Ferhity and the content of organic matter are high in the Bon soil. Tith is good. Available water capacity is high. Permeability is moderate. A seasonal high water table is at a depth of 2 to 6 feet near the channels. Runoff is slow.

Most of the acreage supports native grasses and is used for grazing. No major hazards or limitations affect the use of this soil for range. Although the soil is frequently flooded in places, the additional water is beneficial. Pools of water in some areas of the channels provide temporary watering places for livestock and wildlife.

This sor generally is unsuited to cultivated crops because it is dissected into small tracts and is subject to flooding in the spring. It is suited to tame pasture and hay but harvosting hay is difficult because of the channeled andscape. Examples of suitable pasture plants are aliaifa intermediate wheatgrass, and smooth bromegrass.

This soil is suited to windbreaks and environmental plantings. At climatically suited trees and shrubs grow well. They can be planted by hand. Because of the meandering stream channels however they generally cannot be planted by machine.

The capability unit is VIw 1. Overflow range site (rarely flooded areas). Subirrigated range site (occasionally flooded areas)

Bu-Bullcreek clay. This deep moderately well drained nearly level and gently sloping soil is on low terraces and fans. Areas are 30 to more than 200 acres in size and are irregular in shape. Slopes are smooth or slightly concave.

Typically, the surface layer is grayish brown day about 2 inches thick. The subsoil is gray and grayish brown, firm day about 22 inches thick. It has visible saits in the lower part. The underlying material to a depth of 60 inches is grayish brown day. It has visible saits in the upper part.

Included with this soil in mapping are small areas of Hurley Opal and Promise soils and areas of Slickspota. These soils make up less than 20 percent of any one mapped area. Hurley soils have a sodium affected subsoil. They are in positions on the landscape similar to.

those of the Bullcreek soil. Opal and Promise soils are slightly higher on the landscape than the Bullcreek soil. Also, they are not so dense, and Promise soils have tewer saits throughout. Opal soils are 20 to 40 inches deep to shale. Sickspots have no plant cover. They are in sight depressions

Fertility is low and the content of organic matter moderate in the Buildreek soil. Tith is very poor Available water capacity is low. Permeability is very slow. Bunott is medium. The shortk-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing or hay. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tith.

This soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of the very poor bith and the high content of saits.

The capability unit is VIs-5, Dense Clay range site

Ca—Carter silt loam. This deep, moderately well drained, nearly level soil is on uplands and terraces. Areas are 20 to more than 200 acres in size and are irregular in shape. Siopes generally are smooth

Typically the surface layer is gray self-loam about 4 inches thick. The subsoil is about 14 inches thick. It is dark gray, very firm sitty clay in the upper part, dark grayish brown, very firm clay in the next part, and grayish brown very firm calcareous clay in the lower part. The underlying material to a depth of 60 inches is grayish brown, light brownish gray, and light olive gray calcareous clay. It has accumulations of time throughout in places the subsoil contains more sodium.

Included with this soil in mapping are small areas of Bull creek. Dornal and Promise soils. These soils make upliess than 25 percent of any one mapped area. They are in positions on the landscape similar to those of the Carter soil. The clayey Bullcreek and Promise soils do not have columnar structure in the subsoil. The sitty Dornal soils do not have a claypan subsoil.

Fertility is low and the content of organic matter moderate in the Carter sor. Root penetration is restricted by the dense claypan subsor. Tith is poor. Available water capacity is low or moderate. Permeability is very slow. Runoff is low. The shrink swell potential is very high.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction is a problem Restricted grazing during wet periods helps to prevent surface compaction and deterioration of 5 th.

This soil is suited to tame pasture and hay, but the choice of suitable pasture plants and productivity are limited by the dense claypan subsoil. Only those species that can grow in a soil that has a claypan subsoil are suitable. Examples are affatts, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, and

western wheatgrass. Deferred grazing during wet periods helps to prevent surface compaction.

This soil generally is unsuited to cultivated crops and to windbreaks and environmental plantings. The claypan subsoil restricts water intake and the penetration of plant roots.

The capability unit is VIs-1; Thin Claypan range site.

Cp—Carter-Promise complex. These deep, gently undulating soils are on uplands. The moderately well drained Carter soil is in broad swales, in small, shallow depressions, and on long, smooth slopes. The well drained Promise soil is on slight rises. Areas are 20 to 500 acres in size and are irregular in shape. They are 55 to 65 percent Carter soil and 30 to 40 percent Promise soil. The two soils occur as areas so closely infermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Carter soil is gray silt loam about 4 inches thick. The subsoil is about 14 inches thick. It is dark gray, very firm silty clay in the upper part, dark grayish brown, very firm clay in the next part, and grayish brown, very firm, calcareous clay in the lower part. The underlying material to a depth of 60 inches is grayish brown, light brownish gray, and light office gray, calcareous day it has accumulations of time throughout. In places the subsoil contains more sodium.

Typically, the surface layer of the Promise soil is dark gray sitly clay about 7 inches thick. The subsoil is dark grayish brown and grayish brown, firm and very firm clay about 26 inches thick. In the lower part it is calcareous and has accumulations of time that extend into the underlying material. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, calcareous clay it is mottled in the lower part. In some places shale bedrock is at a depth of 20 to 40 inches. In other places visible salts are in the lower part of the subsoil.

Included with these soils in mapping are small areas of Bullcreek soils. These included soils make up less than 10 percent of any one mapped area. They do not have columnar structure in the subsoil and are more dense than the Promise soil.

Ferblity is low in the Carter soil and medium in the Promise soil. The content of organic matter is moderate in both soils. Root penetration is restricted by the dense claypan subsoil in the Carter soil. Tith is poor in both soils. Available water capacity is low or moderate. Permeability is very slow. Runoff is slow. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction is a problem on both soils. Restricted grazing during wet periods helps to prevent surface compaction and detenoration of tith

These soils are suited to tame pasture and hay, but only those species that can grow in a soil that has a claypan subsoil are suited to the Carter soil. Examples

are sitalfs, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, and western wheatgrass. Deterred grazing during wet periods helps to prevent surface compaction.

This map unit generally is unsuited to cultivated crops and to windbreaks and environmental plantings. The dense claypan subsoil in the Carter soil restricts root penetration.

The Carter soil is in capability unit VIs-1, Thin Claypan range site, the Promise soil is in capability unit ills-3, Clayey range site.

Cr—Cavo-Jerauld slit toams. These deep, nearly level and gently undulating soils are on uplands. The moderately well drained Cavo soil is on slight rises. The somewhat poorly drained Jerauld soil is in small pits and depressions. Areas are 10 to 600 acres in size and are gregular in shape. They are 55 to 65 percent Cavo soil and 15 to 25 percent Jerauld soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Cavo soil is dark gray silt loam about 4 inches thick. The subsurface layer is gray loam about 4 inches thick. The subsurface layer is gray loam about 19 inches thick. In the lower part it is calcareous and has accumulations of time and sails that extend into the underlying material. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, calcareous clay loant. It is mottled in the lower part. In some areas the soil is dark to a depth of more than 20 inches.

Typically, the surface layer of the Jerauld soil is grayish brown sill loam about 2 notes thick. The subsoil is dark grayish brown, dark gray and grayish brown, very firm and I rm day loam about 12 inches thick. In the lower part it is calcareous and has visible salts and accumulations of time. The underlying material to a depth of 60 inches is grayish brown, light brownish gray, and light yellowish brown, calcareous clay loam. It has accumulations of time throughout and visible salts in the upper part. It is mottled in the lower part.

Included with these soils in mapping are small areas of Beadle and Eakin soils. These included soils make up less than 20 percent of any one mapped area. They do not have a sodium affected subsoil. They are on the higher parts of the landscape.

Fertility is low in the Cavo and Jerauld soils. The content of organic matter is moderate in the Cavo soil and low in the Jerauld soil. Both soils contain a detrimental amount of sodium. Tith is poor. Available water capacity is moderate or high in the Cavo soil and low or moderate in the Jerauld soil. Permeability is slow in both soils. Runoff also is slow. The shrink-swell potential is high in the subsoil

Most of the acreage supports native grasses and is used for grazing or hay. Compaction is a problem in

areas of the Jerauld soil. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth

This map unit is suited to cultivated crops, but the sodium affected subsoil in these soils severely limits their productivity. No crops grow well on the Jerauld soil Titling when the soil is wet causes compaction of the subsoil. Early maturing small grain is better suited than row crops. Measures that improve titth and conserve moisture are the main management needs. Examples are minimizing titlage, applying animal manure, chiseling or subsorting, and leaving crop residue on the surface.

This map unit is suited to tame pasture and hay, but very little production can be expected on the Jerauld soil Alfalfa, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, and western wheatgrass are the best suited soccies

The Cavo soil is suited to windbreaks and environmental plantings, but the dense claypan subsoil severely limits root penetration. Trees and shrubs can be established on the Cavo soil, but optimum growth, survival, and vigor are unlikely. The Jerauld soil generally is unsuited to windbreaks and environmental plantings. No trees or shrubs grow well on this soil.

The Cavo soil is in capability unit fVs-2, Claypan range site, the Jerauld soil is in capability unit VIs-1, Thin Claypan range site

CuD—Chantier-Sensarc clays, 2 to 15 percent slopes. These shallow, well drained, gently sloping to strongly sloping soils are on uplands that generally are dissected by drainageways. The Chantier soil is on the amouther, less sloping parts of the landscape. The Sansarc soil is on the sleeper side slopes and ridges. Areas are 50 to several hundred acres in size and are irregular in shape. They are about 60 to 70 percent Chantier soil and 20 to 30 percent Sansarc soil. The two soils occur as areas so closely intermingled or so small that mapping them separatety is not practical.

Typicalty, the surface layer of the Chantier soil is grayish brown, calcareous clay about 3 inches thick. The subsoil is grayish brown, extremely firm, calcareous clay about 5 inches thick. The underlying material is grayish brown calcareous shally clay it has accumulations of lime and visible salts. Light brownish gray, calcareous shalle bedrock is at a depth of about 17 inches. In places the depth to shale is more than 20 inches.

Typically, the surface layer of the Sansarc soil is grayish brown clay about 4 inches thick. The underlying material is light brownish gray, calcareous clay and very shaly clay. Light gray shale bedrock is at a depth of about 15 inches.

Included with these soils in mapping are small areas of Bullcreek and Opal soils and Stickspots. These included soils and Stickspots make up less than 20 percent of any one mapped area. Bullcreek soils and Stickspots are on foot slopes and along dramageways. Bullcreek soils

are more than 40 inches deep to shale. Slickspots have a puddled surface and support little or no vegetation. Opal soils are 20 to 40 inches deep to shale. They are in positions on the tandscape similar to those of the Chantier soil.

Fertility and the content of organic matter are low in the Chantier and Sansarc soils. The Chantier soil contains a detrimental amount of saits. Tilth is poor in both soils. Available water capacity is very low Permeability is very slow in the Chantier soil and alow in the Sansarc soil. Runoff is medium on the Chantier soil and rapid on the Sansarc soil. The shrink-swell potential is very high in both soils.

Most of the acreage supports native grasses and is used for grazing. Water erosion is a hazard if the range is overgrazed. Gullies form along some cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gultying. Reestablishing vegetation is difficult in denuded areas.

These soils generally are too droughty for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The accumulations of saits in the Chantier soil are an additional limitation.

The Chantier soil is in capability unit VIs-5, Dense Clay range site; the Sansarc soil is in capability unit VIe-12, Shallow Clay range site.

DaA—DeGrey-Eakin-Jerauld sitt loams, 0 to 2 percent slopes. These deep, nearly level soils are on uplands. The moderately well drained DeGrey soil is in shallow depressions. The well drained Eakin soil is on slight rises. A few scattered stones are on the surface in some areas. The somewhat poorly drained Jerauld soil is in small pits and depressions. Areas are 10 to 150 acres in size and are irregular in shape. They are about 30 to 40 percent DeGrey soil, 20 to 30 percent Eakin soil, and 15 to 25 percent Jerauld soil. The three soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface tayer of the DeGrey soil is dark grayish brown slit loam about 6 inches thick. The subsurface layer is grayish brown slit loam about 4 inches thick. The subsoil is about 15 inches thick. It is dark grayish brown, very firm sitty clay and grayish brown, firm, calcareous silty clay loam. In the lower part if has accumulations of time that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and light brownish gray calcareous silty clay loam and clay loam. It has visible salts throughout, it is mottled in the lower part.

Typically, the surface layer of the Eakin soil is dark grayish brown slit loam about 7 inches thick. The subsoil is about 29 inches thick. It is dark grayish brown and grayish brown friable silty clay loam in the upper part and light yellowish brown, very friable, motified calcareous slit loam in the lower part, in the lower part it has accumulations of time that extend into the underlying

material. The underlying material to a depth of 60 inches is grayish brown, mottled, calcareous clay loam, in some places the clay loam glacial till is at a depth of more than 40 inches. In other places loamy gracial till is within a depth of 20 inches.

Typically the surface layer of the Jerauld son is grayish brown silt loam about 2 inches thick. The subsoil is dark grayish brown, dark gray and grayish brown very lirm and firm clay loam about 12 inches thick. In the lower part it is calcareous and has visible salts and accumulations of time. The underlying materia to a depth of 60 inches is grayish brown, light brownish gray, and light yellowish brown, calcareous clay loam. It has visible salts in the upper part and accumulations of time throughout. It is motified in the lower part.

ncluded with these soils in mapping are small areas of Beadle Mobridge and Plankinton soils. These included soils make up less than 25 percent of any one mapped area. They do not have a sodium affected subsoil. Beadle soils contain more clay in the subsoil than the Eakin soil. They are in positions on the landscape similar to those of the Eakin soil. The moderately well drained Mobridge soils are dark to a depth of more than 20 inches. They are in swales. The poorly drained.

Plankinton soils are in depressions

Fertility is low in the DeGrey and Jerauld soils. It is medium in the Eakin soil. The content of organic matter is moderate in the DeGrey and Eakin soils and low in the Jerauld soil. The DeGrey and Jerauld soils have a sodium affected subsoil that contains a detrimental amount of sodium salts. Tith is poor in the DeGrey and Jerauld soils. It is good in the Eakin soil. Available water capacity is moderate or high in the DeGrey soil high in the Eakin soil, and low or moderate in the Jerauld soil. Permeability is slow in the DeGrey and Jerauld soils it is moderate in the upper part of the Eakin soil and moderately slow in the lower part. Flunoff is slow on all three soils. The shrink-swell potential is moderate in the Eakin soil and high in the subsoil of the DeGrey and Jerauld soils.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction is a problem in areas of the Jerauid soil. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth.

These soils are suited to tame pasture and hay, but tittle production can be expected on the Jerauld soil. Alfalfa, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, and western wheatgrass are examples of suitable pasture plants that can be grown on the Eakin and DeGrey soils. No pasture plants grow well on the Jerauld soil

This map unit is suited to cultivated crops, but the sodium affected subsoil in the DeGrey and Jerauld soils severely limits their productivity. Early maturing small grain is better suited than row crops. Tilling when the soil is well causes compaction of the subsoil in the DeGrey.

and Jerauld solts. Measures that conserve moisture and improve tith are the main management needs. Examples are minimizing tillage and leaving crop residue on the surface. Including grasses and legumes in the cropping system and subsolling or chiseling improve tith and increase the rate of water intake.

The DeGrey and Eakin soils are suited to windbreaks and environmental plantings, but the dense claypan subsoil in the DeGrey soil severely limits root penetration. The Jerauld soil generally is unsuited to windbreaks and environmental plantings. No trees or shrubs grow well on this soil. Windbreaks can be established on the DeGrey and Jerauld soils, but optimum growth is unlikely

The DeGrey soil is in capability unit IVs-2, Claypan range site; the Eakin soil is in capability unit IIc-2, Sitty range site; the Jerauld soil is in capability unit VIs-1, Thin

Claypan range site

DeD—Delmont loam, 6 to 15 percent slopes. This somewhat excessively drained, gently rolling and rolling soil is on terrace remnants. It is shallow over sandy and gravelly material. In some areas scattered stones are on the surface. Areas are 10 to 100 acres in size and are irregular in shape. Slopes generally are short and conver-

Typically, the surface layer is dark grayish brown loam about 4 inches thick. The subsoil is dark gray, finable, calcareous loam about 12 inches thick. The underlying material to a depth of 60 inches is multicolored, calcareous gravelly sand. It has accumulations of time in the upper part. In some places the gravelly sand is at a depth of more than 20 inches or within a depth of 14 inches.

Included with this soil in mapping are small areas of Java and Ree soils. These soils make up less than 20 percent of any one mapped area. They do not have gravelly material within a depth of 40 inches. Java soils are in positions on the landscape similar to those of the Delmont soil. Ree soils generally are on the less sloping parts of the landscape.

Fertility is medium and the content of organic matter moderate in the Delmont soil. Tilth is good. Available water capacity is low. Permeability is moderate in the upper part of the soil and rapid in the underlying material. Runoff is medium.

Most of the acreage supports native grasses and is used for grazing. Productivity is limited because the soil is droughty. Water erosion is a hazard if the range is overgrazed. Gullies form along some cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent guilying.

This soil is suited to tame pasture and hay, but productivity is limited because of droughtiness. Examples of suitable pasture plants are affails, intermediate wheatgrass, and pubescent wheatgrass.

This soil generally is unsuited to cultivated crops because it is droughty. It is suited to windbreaks and environmental plantings, but droughtness is a limitation. Trees and shrubs can be established, but optimum growth and survival are unlikely. Planting on the contour heips to control erosion.

This soil is a probable source of sand and gravel. The capability unit is Vie-5; Shallow to Gravel range site.

**Do—Dorna silt loam.** This deep, well drained, nearly level and very gently sloping soil is on uplands. Areas are 20 to 100 acres in size and are irregular in shape. Slopes are smooth

Typically, the surface layer is grayish brown sitt loam about 5 inches thick. The subsurface layer also is grayish brown sitt loam. It is about 12 inches thick. It is calcareous in the lower part. The upper part of the underlying material is brown and grayish brown, calcareous sitt loam. The lower part to a depth of 60 inches is grayish brown, light brownish gray, and clive, calcareous sitty clay loam and sitty clay in some places sitty clay loam or sitty clay is at a depth of 12 to 20 inches. In other places the depth to clayey material is more than 40 inches.

Included with this soil in mapping are small areas of the clayey Millboro and Promise soils. These soils make up less than 20 percent of any one mapped area. They contain more clay in the subsoil than the Doma soil. They are in positions on the landscape similar to those of the Doma soil

Fertility is medium and the content of organic matter moderate in the Doma soil. Tilth is good. Available water capacity is moderate or high. Permeability is moderate in the upper part of the soil and slow in the lower part. Runoff is slow. The shrink-swell potential is low in the upper part of the soil and high in the lower part.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay Examples of suitable pasture plants are alfalfa, infermediate wheatgrass, and smooth bromegrass. Measures that help to control wind erosion and conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface, including grasses and legumes in the cropping system, minimizing tillage, stripcropping, and establishing field windbreaks.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture.

The capability unit is ite-1; Silty range site.

Du—Durrstein ailt loam. This deep, poorty drained, level soit is on flood plains along some of the larger drainageways. It is occasionally flooded for brief periods. Areas are 50 to several hundred acres in size and are irregular in shape. Slopes are long and smooth and are characterized by slight microrelief.

Typically, the surface layer is gray silt loam about 1 inch thick. The subsoil is dark gray and gray, very limit sity clay about 18 inches thick. In the lower part it is calcareous and has visible salts and accumulations of time that extend into the underlying material. The underlying material to a depth of 60 inches is gray, calcareous silty clay. It has accumulations of time and nests of gypsum and other salts.

Included with this soil in mapping are small areas of Egas, Egas Variant, and Lane soils and Skickspots. These soils make up less than 20 percent of any one mapped area. Egas soils are shallower to visible salts than the Durrstein soil. They are in positions on the landscape similar to those of the Durrstein soil. Egas Variant soils are calcareous near the surface. They are slightly lower on the landscape than the Durrstein soil. The moderately well drained Lane soils are on the slightly higher parts of the landscape. Slickspots have a puddled surface and do not support vegetation. They are in small pits and depressions.

Fertility and the content of organic matter are low in the Duristein soil. This soil has a sodium affected subsoil that adversely affects the growth of most plants. Tith is poor Available water capacity is moderate. A seasonal high water table is within a depth of 1.5 feet. Permeability is slow. Flunoff also is slow. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for grazing or hay. An excess of salts and compaction are problems. Salt-tolerant species should be favored. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tith. Many areas are potential sites for excavated ponds.

This soil generally is too wet and too sakes for cultivated crops and windbreaks and environmentar plantings. The dense claypan subsoil also is a limitation. The soil is suited to tame pasture and hay, but the choice of pasture plants is limited by the wetness and the high degree of salinity. Examples of suitable pasture plants are tail wheatgrass and western wheatgrass.

The capability unit is Viw-4; Saline Lowland range site.

EaA—Eakin-DeGrey silt loams, 0 to 3 percent slopes. These deep, gently undulating soils are on uplands. The well drained Eakin soil is in convex areas A few scattered stones commonly are on the surface The moderately well drained DeGrey soil is in slightly concave areas. Areas are 20 to several hundred acres in size and are irregular in shape. They are 40 to 50 percent Eakin soil and 25 to 35 percent DeGrey soil. The

two soils occur as areas so closely intermingled or so small that mapping them separately is not practical

Typically, the surface layer of the Eakin soil is dark grayish brown sill loam about 7 inches thick. The subsoil is about 29 inches thick. It is dark grayish brown and grayish brown if able silly diay loam in the upper part and light yellowish brown very frable mottred. Calcareous sill dam in the lower part. The lower part has accumulations of time that extend into the underlying materia. The underlying materia, to a depth of 60 inches is grayish brown, mottled calcareous day loam in some places the day loam gradia to is at a depth of more than 40 inches. In other places loamy gradia, life is within a depth of 20 inches.

Typically the surface layer of the DeGrey soil is dark grayish brown silt loam about 6 inches thick. The subsurface layer is grayish brown silt loam about 4 inches thick. The subsoil is about 15 inches thick. It is dark gray sh brown very firm sity clay and grayish brown firm calcareous silty clay loam. In the lower part. I has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pate brown and light brownish gray calcareous sity day loam, and clay loam. It has visible saits throughout. It is mottled in the lower part.

Included with these soils in mapping are small areas of Beadie Java Jerauld Mobildge and Plankinton soils. These included soils make up less than 25 percent of any one mapped area. Beadle soils contain more clay in the subsoil than the Eakin soil. They are on the low parts of the landscape. The teamy Java soils are on low mounds and ridges. Jerauld soils have visible salts within a depth of 16 inches. They are in small pits and depressions. The moderately well drained Mobildge soils are in swales. They do not have a sodium affected subsoil and are dark to a depth of more than 20 inches. The poorly drained Plankinton soils are in depressions.

Pertiety is medium in the Eakin soil and low in the DeGrey soil. The content of organic matter is moderate in both soils. The sodium affected subsoil in the DeGrey soil adversely affects the growth of most plants. Tith is good in the Eakin soil and poor in the DeGrey soil. Available water capacity is high in the Eakin soil and medium or high in the DeGrey soil. Permeability is moderate in the upper part of the Eakin soil and moderately slow in the lower part. It is slow in the DeGrey soil. Runoff is slow on both soils. The shrink-swell potential is moderate in the Eakin soil and high in the DeGrey soil.

About half of the acreage is cropland. These sofs are suited to cultivated crops and to tame pasture and hay Examples of suitable pasture plants are a taita, intermediate wheatgrass, and pubescent wheatgrass. The sodium affected subsoil in the DeGrey soil restricts foot penetration and the rate of water intake. Tuhing when the soil is wet causes compaction of the subsoil in the DeGrey soil. Measures that improve bith and

conserve moisture are the main management needs. Examples are leaving crop residue on the surface, minimizing tillage including grasses and legumes in the cropping system, and applying animal manure. Subsoiling or chiseling improves tilth and increases the rate of water intake.

No major hazards or limitations affect the use of these soils for range. Proper stocking rates and timely determent of grazing or rotation grazing help to maintain maximum productivity.

These soils are suited to windbreaks and environmental prantings but the sodium affected subsoil of the DeGrey soil limits roof penetration. All climatically suited trees and shrubs grow well on the Eakin soil, except for those that require an abundant supply of moisture. Windbreaks and environmental plantings can be established on the DeGrey soil but optimum growth, survival, and vigor are unlikely.

The Eaton soil is in capability unit lic 2. Sitty range site the DeGrey soil is in capability unit IVs-2, Claypan range site.

Eq-Egas sitty clay loam. This deep poorly drained, leve soil is on flood plains along some of the larger drainageways. It is occasionally flooded for brief periods. Areas are 100 to several hundred acres in size and are irregular in shape. Slopes are smooth.

Typically the surface layer is gray silty clay loarn about 1 inch thick. The subsurface layer is dark gray silty clay about 4 inches thick. The next layer is dark gray very him calcareous silty clay about 8 nches thick. It has visible salts throughout. The underlying material to a depth of 60 inches is gray and light gray calcareous silty clay and clay loarn, it has visible salts throughout. It is motified in the lower part.

Included with this soil in mapping are small areas of Duristein Egas Variant and Lane soils and ereas of Slickspots. These inclusions make up less than 20 percent of any one mapped area. Duristein soils have a sodium affected subsoil. They are in positions on the tandscape similar to those of the Egas soil. Egas Variant soils and Slickspots are in the low areas on the flood plains. Egas Variant soils are calcareous near the surface and are not so saling as the Egas soil. Slickspots have a puddled surface and support liftle or no vegetation. The moderately well drained Lane soils are slightly higher on the landscape than the Egas soil.

Fertility is low and the content of organic matter moderate in the Egas soil. This soil is very saline. Tilth is poor Available water capacity is moderate or high. Permeability is slow. A seasonal high water table is within a depth of 1 foot. Runoff is slow. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for grazing or hay. An excess of salts and compaction are problems. Salt-loierant species should be favored. Restricted grazing during wet periods helps.

to prevent surface compaction and detenoration of fifth Many areas are potential sites for excavated ponds

This soil generally is unsuited to cultivated crops, tame pasture and hay and windbreaks and environmental plantings because of welness, the flooding, and the high concentration of salts.

The capability unit is VIw-4. Saline Lowland range site.

Ew—Egas Variant silty clay loam. This deep very poorly drained level soil is on flood plains along some of the larger drainageways. It is frequently flooded or ponded Areas are 20 to 250 acres in size and are irregular in shape. Stopes are smooth or slightly concave.

Typically the surface layer is dark gray calcareous sity clay loam about 4 inches thick. The subsurface layer is gray calcareous sity clay loam about 6 inches thick. The next layer is grayish brown, triable calcareous sitly clay loam about 10 inches thick. It has accumulations of time and satts that extend into the underlying material. The underlying material to a depth of 60 inches is gray calcareous sitly clay loam.

Included with this soil in mapping are small areas of Duristein and Egas soils. These soils make upliess than 15 percent of any one mapped area. They are slightly higher on the flood plains than the Egas Variant soil. Duristein soils have a sodium affected subsoil Egas soils contain more sails and less time than the Egas Variant soil.

Fortility is medium and the content of organic matter moderate in the Egas Variant soil. Available water capacity is moderate or high. Permeability is slow. A seasonal high water table is within a depth of 3 feet. As much as 1 foot of water ponds on the surface during some well periods. Burnoff is pended.

Most of the acreage supports native grasses and is used for grazing or hay. An excess of saits, ponding and compaction are problems. Restricted grazing during well periods he ps to prevent surface compaction and deterioration of tilth. Many areas are potential sites for excavaled ponds.

This soil generally is unsuited to cultivated crops, tame pasture and hay and windbreaks and environmental plantings because of the ponding

The capability unit is Vw 1. Wetland range site.

Fa. Farmsworth silt loam. This deep somewhat poorly drained, nearly level soil is on flood plains. It is subject to rare flooding. Areas are 10 to more than 100 acres in size and are irregular in shape. Siopes are smooth or slightly concave.

Typically the surface layer is gray silt loam about 5 inches thick. The subsurface layer is light gray silt loam about 3 inches thick. The subsoil is dark gray and dark grayish brown, very firm silty clay about 31 inches thick. In the lower part it is calcareous and has visible salts. The underlying material to a depth of 60 inches is

grayish brown and light brownish gray motified calcareous sifty dray loam it has visible salts in the upper part.

Included with this soil in mapping are small areas of Bon Durrstein Egas. Lane and Ree soils. These soils make upliess than 25 percent of any one mapped area. Bon Lane and Ree soils do not have a sodium affected subsoil. They are slightly higher on the flood plains then the Farmsworth soil. The poorly drained Durrstein and Egas soils are on the lower parts of the flood plains.

Fert. Ity is medium and the content of organic matter moderate in the Farmsworth soil. The sodium in this soil adversely affects the growth of most plants. Tifth is poor Available water capacity is moderate or high. A seasonal high water table is all a depth of 3 to 6 feet. Permeability is slow or very slow. Runoff is slow. The shrink-swell potential is high in the subsoil.

About half of the acreage is cropland. This soil is suited to cultivated crops, but the sod um affected subsoil can restrict the penetration of plant roots. The best suited crops are those that are tolerent of drought and sodium sails. Farly maturing small grain is better suited than corn. Thing when the soil is well causes compaction of the subsoil. Measures that improve titth and conserve moisture are the main management needs. Examples are minimizing tillage leaving crop residue on the surface, and including grasses and legumes in the cropping system. Subsoiling helps to break up the claypan subsoil and increases the rate of water intake for a short time.

This soil is suited to tame pasture and hay. Only those species that can grow in a soil that has a claypan subsoil and that contains sodium salts are suitable. Affaita crested wheatgrass intermediate wheatgrass, pubescent wheatgrass and western wheatgrass are examples. Deferred grazing during well periods helps to prevent surface compaction.

No major hazards or imitations affect the use of this soil for range. Proper stocking rates and timely determent of grazing or rotation grazing help to maintain maximum productivity. Many areas are potential sites for excavated ponds.

This son is suited to windbreaks and environmental plantings, but the sodium affected subsoil severely limits root penetration. Optimum growth, survival, and vigor are unlikely.

The capability unit is Vs-2 Claypan range site

GeE—Gettys clay loam, 9 to 25 percent slopes.
This deep well drained, strongly sloping and moderately steep soil is on uplands. A few stones commonly are on the surface. Areas are 50 to 200 acres in size and are irregular in shape. Slopes generally are convex.

Typically the surface layer is grayish brown, calcareous clay loam about 2 inches thick. The next layer is grayish brown triable mothed calcareous clay loam about 6 inches thick. It has accumulations of imme

that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray mottled, calcareous clay loam and clay. In some places the soil contains less clay. In other places shale bedrock is within a depth of 40 inches.

Included with this soil in mapping are small areas of Beadle Lowry and Sully soils. These soils make upless than 25 percent of any one mapped area. Beadle soils are more than 12 inches deep to lime. They are on the lower side slopes. The sity Lowry and Sully soils are in positions on the landscape similar to those of the Gettys soil.

Fertility and the content of organic matter are low in the Gellys soil. Available water capacity is moderate or high. Permeability is moderately slow. Bunoff is rapid. The shrink swell potential is high.

Most of the acreage supports native grasses and is used for grazing. Water eresion is a hazard on this strongly sloping and moderately sleep soit unless an adequate plant cover is maintained. Reestablishing vegetation is difficult in denuded areas. Many areas in the deeper draws are suitable sites for stock water impoundments.

This soil is suited to tame pasture and hay but the choice of pasture plants and productivity are limited by the low fertility, the high content of time, and a severe erosion hazard. The best suited pasture prants are alfalfa, intermediate wheatgrass, and smooth bromograss.

This soil generally is too steep for cultivated crops and windbreaks and environmental plantings. Climatically suited trees and shrubs can be established for special purposes if they are planted by hand and given special care.

The capability unit is Vie-3. Thin Upland range site.

GeF---Gettys clay loam, 25 to 40 percent slopes. This deep well drained steep soil is on uplands. Small stones and cobbles are on the surface Landsides occur in some areas. Areas are 60 to severa hundred acres in size and are irregular in shape. Slopes generally are convex.

Typically, the surface layer is grayish brown, calcareous clay loam about 2 inches thick. The next layer is grayish brown friable mottled calcareous clay loam about 6 inches thick. It has accumulations of time that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray mottled, calcareous clay loam and clay in some places the soil contains less clay in other places shale bedrock is within a depth of 40 inches.

Included with this soil in mapping are small areas of Sansaro Schamber and Suily soils. These soils make up tess than 25 percent of any one mapped area. The shallow clayey Sansaro soils are lower on the landscape than the Gettys soil. Schamber soils are shallow to

gravel. They are on knolls and ridges. The sity Sully soils are above the Gettys soil on the landscape.

Fertility and the content of organic matter are low in the Gettys soil. Available water capacity is moderate of high. Permeability is moderately slow. Runoff is rapid. The shrink swell potential is high.

Nearly all of the acreage supports native grasses and is used for grazing. Water erosion is a hazard on this steep soil unless an adequate plant cover is maintained. Reestablishing vogetation is difficult in denuded areas. Many areas in draws are suitable sites for stock water impoundments.

This soil generally is too steep for cultivated crops, tame pasture and hay and windbreaks and environmental plantings.

The capability unit is Vile 3. Thin Upland range site.

GhA—Glenham loam, 0 to 3 percent slopes. This deep well drained, very gently sloping soi is on uplands. A few scattered stones commonly are on the surface. Areas are 10 to 80 acres in size and are irregular in shape. Slopes are smooth or slightly convex.

Typically the surface layer is dark grayish brown loam about 4 inches thick. The subsoil is dark grayish brown, brown, and light brownish gray triable clay loam about 12 inches thick. In the lower part it is calcareous and has accumulations of time that extend into the underlying materia. The underlying materia to a depth of 60 inches is light brownish gray friable calcareous clay loam it is mottled in the lower part in some places the subsoil contains less sand. In other places it contains more clay

Included with this soil in mapping are small areas of DeGrey Highmore Java Jerauld, Mobildge and Plankinton soils. These soils make upless than 25 percent of any one mapped area. The sodium affected DeGrey and Jerauld soils are in small depressions. Highmore soils contain less sand in the subsoil than the Gionham soil. They are in positions on the landscape similar to those of the Gienham soil. Java soils have time within a depth of 10 inches. They are on knots and ridges. The moderately well drained Mobildge soils are in swales. The poorly drained Plankinton soils are in depressions.

Fertility is medium and the content of organic matter moderate in the Gienham soil. This good Available water capacity is high. Permeability is moderate in the subsoil and moderately slow in the underlying material. Hunoff is slow. The shook swell potential is moderate.

About harf of the acreage is cropland. This soil a suited to cultivated crops and to tame pasture and hay Examples of suitable pasture plants are affairla, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture are the main management needs in cultivated areas. Minimizing tillage leaving crop residue on the surface and including grasses and legumes in the cropping system are examples.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely determent of grazing or rotation grazing help to maintain maximum productivity.

This soiles suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture.

The capability unit is lic-2; Sity range site.

GkB—Glenham-Java loams, 3 to 6 percent slopes. These deep well drained, undulating soils are on uplands. The Glenham soil is on the smooth or slightly convex side slopes. The Java soil is on knolls and ridges. Scattered stones are common on the surface m some areas. Areas are 20 to more than 1,000 acres in size and are irregular in shape. They are 50 to 60 percent Glenham soil and 20 to 30 percent Java soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically the surface layer of the Glenham soil is dark grayish brown very fnable loam about 4 inches thick. The subsoil is dark grayish brown brown and light brownish gray, fnable clay loam about 12 inches thick in the lower part it is calcareous and has accumulations of time that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray triable calcareous clay loam. It is mottled in the lower part in some places the subsoil contains less sand. In other places it contains more clay.

Typically the surface layer of the Java soil is dark grayish brown calcareous loam about 4 inches thick. The subsoil is dark grayish brown and pale brown friable, calcareous loam about 14 inches thick. In the lower part, I has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and light yellowish brown, mottled, calcareous loam and clay loam.

Included with these soils in mapping are small areas of DeGrey, Jerauld, Mobridge, and Plankinton soils. These included soils make uplies than 25 percent of any one mapped area. The sodium affected DeGrey and Jerauld soils are on flats and in small depressions. The moderately well drained Mobridge soils are in swales. The poorly drained Plankinton soils are in depressions.

Fertility is medium in the Glenham soil and low in the Java soi. The content of organic matter is moderate in the Glenham soil and low in the Java soil. Tith is good in both soils. Available water capacity is high. Permeability is moderate in the subsoil and moderately slow in the underlying material. Runoff is medium. The shinnii swell potential is moderate.

About half of the acreage is cropland. These soils are suited to cultivated crops. Measures that control erosion and conserve moisture are the main management needs, improving ferbilly also is a concern because the high content of time in the surface layer of the Java soil.

adversely affects the availability of plant numents including grasses and regumes in the cropping system, leaving crop residue on the surface and minimizing billage help to control erosion conserve moisture and improve tertility. Applying animal manure also improves fertility. Contour farming grassed waterways and terraces can help to control erosion, but in some areas the slopes are too short or too irregular for contouring and terracing.

A cover of tame pasture plants or hay is effective in controlling erosion. These soils are suited to tame pasture but the choice of pasture plants and productivity are imitted on the Java soil because the high content of lime in the surface layer adversely affects the availability of plant nutrients. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth allomegrass.

No major hazards or limitations affect the use of these soils for range. Proper stocking rates and timely determent of grazing or rotation grazing help to maintain maximum productivity.

These soils are suited to windbreaks and environmenta plantings but the high content of lime in the surface rayer of the Java soil is a limitation. All committees are soil except for those that require an abundant supply of moisture. Trees and shrubs can be established on the Java soil but optimum survival growth, and vigor are unlikely. Planting on the contour helps to control erosion.

The Glenham soil is in capability unit Ite-2, the Java soil in capability unit Itle-12; both soils are in Sitty range site.

HgB—Highmore-Java complex, 1 to 5 percent slopes. These deep, well-drained gently sloping and undusting soils are on uplants. The Highmore soil is on the smoother slopes. The Java soil is on the more convex slopes. Areas are 20 to several hundred acres in size and are irregular in shape. They are 50 to 70 percent Highmore soil and 20 to 40 percent Java soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically the surface layer of the Highmore soil is dark grayish brown set loam about 6 inches thick. The subsoil is dark brown and light ye lowish brown thable sitly clay toam about 17 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The upper part of the underlying material is lightly elowish brown mottled calcareous sitly day loam. The lower part to a depth of 60 inches is light brownish gray mottled, calcareous clay loam. In places the day loam gladia till is at a depth of 20 to 40 inches.

Typically the surface layer of the Java soil is dark grayish brown calcareous loam about 4 inches thick. The subsoil is dark grayish brown and pale brown.

mable, calcareous loam about 14 inches thick, in the lower part it has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is paie brown and light yellowish brown, mottled, calcareous loam and clay loam. In some places the subsoil contains more clay. In other places the surface layer is thinner.

Included with these soils in mapping are small areas of Beadle DeGrey Gienham Mobridge and Plankinton soils. These included soils make up less than 25 percent of any one mapped area. Beadle and Glenham soils are in positions on the landscape similar to those of the Highmore soil. They are deeper to lime than the Java soil. Also, Beadle soils contain more day in the subsoil than the Highmore and Java soils. The sodium affected DeGrey soils are in small depressions. The moderately well drained Mobridge soils are in swales. The poorly drained Plankinton soils are in depressions.

Fertility is medium in the Highmore soil and low in the Java soil. The content of organic matter is moderate in the Highmore soil and low in the Java soil. Tith is good in both soils. Available water capacity is high. Permeability is moderate in the upper part of both soils and moderately slow in the lower part. Flunoff is medium. The shinik-swell potential is moderate.

About half of the acreage is cropland. These soils are suited to cultivated crops. Measures that control erosion and conserve moisture are the main management heeds. Improving fertility also is a concern because the high content of time in the surface layer of the Java soil adversely affects the availability of plant nutnerits including grasses and legumes in the cropping system, leaving crop residue on the surface, and minimizing billage help to control erosion, conserve moisture, and improve fertility. Applying animal manure also improves fertility.

A cover of tame pasture plants or hay is effective in controlling erosion. These soils are suited to tame pasture and hay, but the choice of pasture plants and productivity are limited on the Java soil because the high content of lime in the surface layer adversely affects the availability of plant nutrients. Examples of suitable pasture plants are affaits, intermediate wheatgrass, and smooth bromegrass.

No major hazards or limitations affect the use of these soils for range. Proper stocking rates and timely determent of grazing or rotation grazing help to maintain maximum productivity.

These soils are suited to windbreaks and environmental plantings, but the high content of lime in the surface layer of the Java soil is a limitation. All climatically suited trees and shrubs grow well on the Highmore soil except for those that require an abundant supply of moisture. Trees and shrubs can be established on the Java soil, but optimum growth, survival, and vigor are unlikely.

The Highmore soil is in capability unit ile-1, the Java soil in capability unit lile-12; both soils are in Sitty range site.

HgC—Highmore-Java complex, 5 to 9 percent slopes. These deep weil drained, undurating and gently rolling sods are on uplands. The Highmore soil is on the smooth slopes. The Java soil is on the convex parts of the landscape. Areas are 20 to 300 scres in size and are irregular in shape. They are 40 to 50 percent Highmore soil and 35 to 45 percent Java soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically the surface layer of the Highmore soil is dark grayah brown silt loam about 6 inches thick. The subsoil is dark brown and light yellowish brown, fnable silty clay loam about 17 inches thick. In the lower part it is calcareous and has accumulations of time that extend into the underlying material. The upper part of the underlying material is light yellowish brown mothed, calcareous silty clay loam. The lower part to a depth of 60 inches is light brownish gray, mottled, calcareous clay loam, in places the clay loam glacial till is at a depth of 20 to 40 inches.

Typically, the surface layer of the Java and is dark grayish brown, calcareous loam about 4 inches thick. The subsoil is dark grayish brown and pale brown, finable, calcareous loam about 14 inches thick in the lower part it has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and light yellowish brown, motted calcareous loam and clay loam. In some places the subsoil contains mixed clay. In other places the surface layer is thinner.

tricluded with these soils in mapping are small areas of Beadle DeGrey Gierham. Mobridge and Plankinton soils. These included soils make up less than 25 percent of any one mapped area. Beadle and Gierham soils are in positions on the landscape similar to those of the Highmore soil. They are deeper to lime than the Java soil. Also, Beadle soils contain more clay in the subsoil than the Highmore and Java soils. The sodium affected DeGrey soils are in small depressions. The moderately well drained Mobridge soils are in swates. The poorly drained Plankinton soils are in depressions.

Fertility is medium in the Highmore soil and low in the Java soil. The content of organic matter is moderate in the Highmore soil and low in the Java soil. Titth is good in both soils. Available water capacity is high. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Aunoff is medium. The shrink-swell potential is moderate.

About haif of the acreage is croptand. These soils are suited to cultivated crops. Measures that control erosion and conserve moisture are the main management needs improving fertility also is a concern because the high content of lime in the surface layer of the Java soil.

adversely affects the availability of plant numerits. Leaving crop residue on the surface, including grasses and lagumes in the cropping system, and minimizing tillage help to control erosion, conserve moisture, and improve fertility. Applying arimal manure also improves fertility. Contour farming, grassed waterways, and terraces can help to control erosion, but in some areas slopes are too short or too irregular for contouring and terracing.

A cover of tame pasture plants or hay is effective in controlling erosion. These soils are suited to tame pasture, but the choice of pasture plants and productivity are limited on the Java soil because the high content of lime in the surface layer adversely affects the availability of plant nutrients. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass.

No major hazards or limitations affect the use of these soils for range, however, water erosion is a hazard if the range is overgrazed. Guilles form along some cattle traits. Fencing and other means of controlling livestock traific patterns help to prevent gullying

These soils are suited to windbreaks and environmental plantings, but the high content of time in the Java soil is a limitation. All climatically suited trees and shrubs grow well on the Highmore soil, except for those that require an abundant supply of moisture. Trees and shrubs can be established on the Java soil, but optimum growth, survival, and vigor are unlikely. Planting on the contour helps to control erosion.

The Highmore soil is in capability unit life-1, the Java soil in capability unit IVe-3, both soils are in Silty range site.

HmA—Highmore-Mobridge silt loams, 0 to 4 percent alopes. These deep, nearly level, undulating and gently stoping soils are on uplands. The well drained Highmore soil is on the smooth and convex slopes. A few scattered stones commonly are on the surface. The moderately well drained Mobridge soil is in swales. It is occasionally flooded for very brief periods. Areas are 25 to several hundred acres in size and are irregular in shape. They are 40 to 60 percent Highmore soil and 20 to 40 percent Mobridge soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Highmore soil is dark grayish brown allt loam about 6 inches thick. The subsoil is brown and light brownish gray, friable sity clay loam about 20 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pate yellow, light yellowish brown, and light gray, motified, calcareous sitt loam. In some places clay loam glacial till is at a depth of 20 to 40 inches. In other places the subsoil contains less clay

Typically, the surface soil of the Mobridge soil is very dark grayish brown sitt loam about 14 inches thick. The subsoil is dark grayish brown, grayish brown, and light brownish gray, firm sitty clay loam about 23 inches thick in the lower part it is calcareous and has accumulations of time that extend into the underlying material. The underlying material to a depth of 60 inches is lightly ellowish brown, calcareous sitty clay loam. In places the subsoil contains more clay.

included with these soils in mapping are small areas of DeGrey, Glenham, Java, and Plankinton soils. These included soils make up less than 25 percent of any one mapped area. The sodium affected DeGrey soils are in small depressions. Glenham soils contain more sand in the subsoil than the Highmore soil. They are in positions on the tandscape similar to those of the Highmore soil. Java soils have time at the surface and contain more sand in the subsoil than the Highmore and Mobridge soils. They are on knolls and ridges. The poorly drained Plankinton soils are in depressions.

Fertility is medium in the Highmore soil and high in the Mobridge soil. The content of organic matter is moderate in the Highmore soil and high in the Mobridge soil. Tith is good in both soils. Available water capacity is high. Permeability is moderate. Runoff is medium on the Highmore soil and slow on the Mobridge soil. The shrink-swell potential is moderate in both soils.

Most of the acreage is cropland. These sola are suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and minimizing tillage. In some years fieldwork is delayed because the Mobridge soil receives runoff from adjacent soils, but in most years the additional moisture is beneficial.

No major hazards or limitations affect the use of these soils for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

These soils are suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well on the Highmore soil, except for those that require an abundant supply of moisture. Those that require an abundant supply of moisture grow especially well on the Mobridge soil.

The Highmore soil is in capability unit tic-2, Sifty range site; the Mobridge soil is in capability unit lic-3, Overflow range site.

HoB—Hurley slit loam, 0 to 6 percent slopes. This moderately deep, well drained, nearly level and gently sloping soil is on uplands. Areas are 10 to 100 acres in size and are irregular in shape. Slopes are smooth or slightly convex and are characterized by slight microrelief in some greas.

Typically the surface layer is light brownish gray sittleam about 2 inches thick. The subson is dark grayish brown, very firm clay about 12 inches thick. In the lower part it is calcareous and has accumulations of time and saits. The underlying material is grayish brown and light brownish gray calcareous clay and shally dray. It has accumulations of time and saits, Light gray and olive yellow calcareous shall beforek is at a depth of about 30 inches. In some areas the shalle is below a depth of 40 inches.

Included with this soil in mapping are small areas of Buildreek, Chantier Opal and Promise soils. These soils make up less than 25 percent of any one mapped area. They do not have a sodium affected subsoil Buildreek soils are in positions on the landscape similar to those of the Hutley soil. Chantier Opal and Promise soils are slightly higher on the landscape than the Hutley soil.

Ferrity and the content of organic matter are low in the Hurley son. The sodium affected subson contains a detrimental amount of sodium salts. Titch is poor Available water capacity is low. Permeability is very slow. Runoff is medium. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tith.

This soil generally is unsuited to cultivated crops, tame pasture and hay and windbreaks and environmental plantings. The dense claypan subsoil the high content of sails in the subsoil, and the low available water capacity are mitations.

The capability unit is VIs-1. Thin Claypan range site

MsA—Hurley-Slickspots complex, 1 to 4 percent slopes. This map unit occurs as areas of a moderately deep well-drained nearly level and gently sloping Hurley soil intermingled with Slickspots. It is on uplands. The Hurley soil is on slight rises, and the Slickspots are in small depressions. Slopes are slightly concave. Areas are 10 to 200 acres in size and are irregular in shape. They are 55 to 65 percent Hurley soil and 15 to 25 percent Slickspots. The Hurley soil and the Slickspots occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Hurley soil is light brownish gray silt loam about 2 inches thick. The subsoil is dark grayish brown, very firm clay about 12 inches thick. In the lower part it is calcareous and has accumulations of time and salts. The underlying material is grayish brown and light brownish gray calcareous clay and shally clay. It has accumulations of time and salts. Light gray and olive yet ow calcareous shalle bedrock is at a depth of about 30 inches, in some areas the shale is below a depth of 40 inches.

The surface of the Sickspots is so crusted that it is nearly impervious to water. Visible accumulations of salts are at or near the surface. The soil material to a depth of

about 30 inches is dense, massive clay. Shale bedrock is at a depth of about 30 inches.

Included with the Hurley soil and the Slickspots in mapping are small areas of Bullcreek Chantier and Opal soils. These included soils make up less than 20 percent of any one mapped area. They do not have a sodium affected subsoil. Bullcreek soils are in positions on the landscape similar to those of the Hurley soil. Chantier and Opal soils are slightly higher on the landscape than the Hurley soil.

Fertility and the content of organic matter are low in the Hurley soil. The sodium affected subsoil contains a detiriental amount of salts. Jith is poor. Available water capacity is low. Permeability is very slow. Runoff is medium. The shirink sweet potential is very high.

All of the acreage supports native grasses and is used for grazing. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tith. The Slickspots generally support little or no vegetation, but they do support a sparse stand of weeds and pricklypear during wet periods.

This map unit is unsurted to cultivated crops tame pasture and hay, and windbreaks and environmental plantings. The dense claypan subsoil the high content of saits in the subsoil the low available water capacity, and the bare areas are smitations.

The Hurley soil is in capability unit VIs-1, Thin Claypan range site; the Slickspots are in capability unit VIIIs-3 and are not assigned to a range site.

These deep well drained strongly sloping and moderately steep sous are on uplands. The Java soil is on the mid and lower side slopes and on some of the broader ridgetops. The Betts soil is on nidges and the upper side slopes. Scattered glacial stones commonly are on the surface and throughout the soils (fig. 5). Areas are 10 to more than 200 acres in size and are irregular in shape. They are 45 to 55 percent Java soil and 25 to 35 percent Betts soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically the surface layer of the Java soil is dark grayish brown calcareous loam about 4 inches thick. The subsoil is dark grayish brown and pale brown, thable calcareous loam about 14 inches thick. In the lower part it has accumulations of time that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and light yellowish brown, mottled, calcareous loam and clay loam.

Typically the surface layer of the Betts soil is dark grayish brown calcareous loam about 3 inches thick. The next layer is light brownish gray fnable, calcareous clay loam about 5 inches thick. The underlying material to a depth of 60 inches is grayish brown and light yellowish brown, calcareous clay loam. Accumulations of

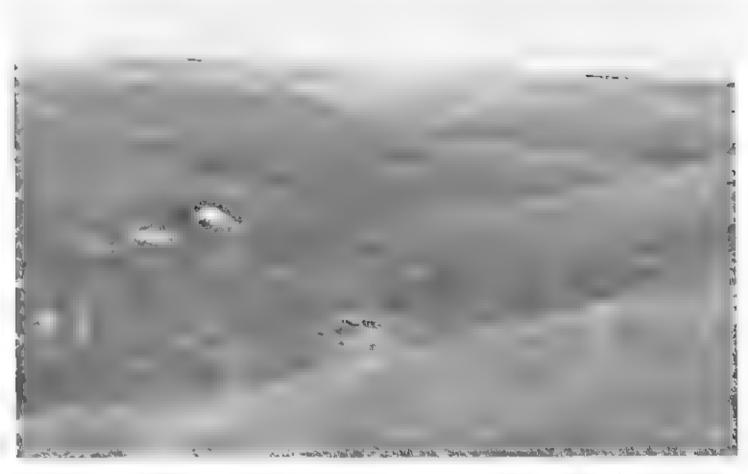


Figure 5.—Scattered stones on the surface of Java-Betts loams, 9 to 20 percent slopes. Nearly all areas of these soils are used as range.

I me are throughout the transitional layer and the upper part of the underlying materia. Nests of gypsum and mottles are in the lower part of the underlying materia. In places the soil contains more clay throughout.

ncluded with these so is in mapping are small areas of Delmont, Glenham, Okaton, and Schamber so is. These included so ils make upliess than 20 percent of any one mapped area. Delmont so ils are 14 to 20 inches deep over sandy and grave ly material. They are on some knolls and ridges. Glenham so ils are deeper to lime than the Java and Betts so is. They are in the less sloping areas. The shallow, clayey Okaton so ils are in positions on the landscape similar to those of the Betts so il. Schamber so ils are less than 10 inches deep to gravelly material. They are on knolls and ridges.

Fertility and the content of organic matter are low in the Java and Betts soils. Tilth is good in both soils. Available water capacity is high. Permeability is moderate in the upper part of the profile and moderately slow in the underlying material. The shrink-swell potential is moderate. Runoff is rapid.

Most of the acreage supports native grasses and is used for grazing. These strongly sloping and moderately steep soils are subject to water erosion unless an adequate plant cover is maintained. Reestablishing vegetation is difficult in denuded areas. Many areas in the deeper draws are suitable sites for stock water impoundments.

These soils are suited to tame pasture and hay, but the choice of pasture plants and productivity are limited by the low fertility and the high content of lime at the surface. Alfaifa, intermediate wheatgrass, and smooth bromegrass are suitable species.

These soils generally are too steep for cultivated crops and windbreaks and environmental plantings. Trees and shrubs can be established for special purposes in the ess sloping areas of the Java soil if they are planted by hand and given special care.

The capability unit is VIe-3; the Java soil is in Silty range site, the Betts soil is in Thin Upland range site.

JgC—Java-Glenham loams, 6 to 9 percent slopes. These deep well drained, gently rolling or moderately sloping soils are on uplands. The Java soil is on knotts and ridges. The Glenham soils on the smooth, lower side slopes. Gracial boulders and stones commonly are on the surface. Areas are 10 to 100 acres in size. They are long and narrow or are irregular in shape. They are 40 to 50 percent Java soil and 35 to 45 percent. Grenham soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically the surface layer of the Java soil is dark grayish brown, calcareous loam about 4 inches thick. The subsoil is dark grayish brown and pale brown frieble calcareous loam about 14 inches thick. In the lower part it has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and ight yellowish brown mottled calcareous loam and clay loam. In places the dark colors extend to a depth of less than 7 inches.

Typically the surface layer of the Glenham soil is dark gray ship brown loam about 4 inches thick. The subsoil is dark grayish brown, brown, and light brownish gray finable clay loam about 12 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. It is mottled in the lower part. In some areas the subsoil contains less sand. In other areas it contains more clay. In places the soil is dark to a depth of more than 20 inches.

Included with these soils in mapping are small areas of Delmont. Oahe and Schamber soils. These included soils make upliess than 25 percent of any one mapped area. They are undertain by graveily material. Delmont and Oahe soils are on some of the higher less sloping parts of the landscape. Schamber soils are on ridges.

Fertility is low in the Java soil and medium in the Glenham soil. The content of organic matter is low in the Java soil and moderate in the Glenham soil. If ith is good in both soils. Available water capacity is high. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Flunoff is medium. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing or hay. No major hazards or limitations affect the use of these soils for range, however, water erosion is a hazard if the range is overgrazed. Gulkes form along some cattle trails. Fencing and other means of controlling avestock traffic patterns help to prevent ourlying.

These soils are suited to cultivated crops. The high content of lime in the surface layer of the Java soil

adversely affects the availability of plant numents. Measures that help to control erosion conserve moisture and improve fertility are the main management needs. Examples are leaving crop residue on the surface minimizing triage and nouding grasses and legumes in the cropping system. Contour farming and terracing can help to control erosion, but in some areas the slopes are too short or too irregular for contouring or terracing. Grassed waterways help to keep gui les from forming. In some areas the surface stones hinder the use of farm machinery.

A cover of hay or tame pasture plants is effective in controlling erosion. These soils are suited to tame pasture and hay but the choice of plants and productivity are iimited on the Java soil by the low fertility and a high content of time at the surface. Attaita, intermediate wheatgrass, and smooth bromegrass are suitable species.

These soris are suited to windbreaks and environmental plantings but the high content of lime at the surface of the Java soil is a imitation. All climatically suited trees and shrubs grow well on the Gienham soil, except for those that require an abundant supply of moisture. Trees and shrubs can be established on the Java soil but optimum growth lygor, and survival are unlikely. Planting on the contour helps to controllerosion.

The Java soil is in capability unit iVe-3. Sitty range site the Glenham soil is in capability unit life-2, Sitty range site.

Ko—Kolis sity clay This deep poorly drained level soi is in depressions on uplands. It is pended during pends of snowmelt and heavy rainfal. Areas are 10 to 250 acres in size and are over or irregular in shape. Siopes are slightly concave.

Typically the surface layer is gray silty dray about 2 inches thick. The subsor is gray very firm, motified calcareous clay about 24 inches thick. The underlying material to a depth of 60 inches is gray very firm motified calcareous clay in places the surface tayer is silty clay loam.

Included with this soil in mapping are small areas of the well drained Promise soils. These soils are near the edges of the mapped areas. They make up less than 5 percent of any one mapped area.

Fertility is medium and the content of organic matter moderate in the Kolls soil. Tilth is poor. Available water capacity is low or moderate. Permeability is very slow. A seasonal high water table is within a depth of 1.5 feet most of the year. As much as 1.0 fool of water ponds on the surface during some wet periods. Runoff is ponded. The shrink swell potential is very high.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction and ponding are problems. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth. Many areas are potential sites for excavated ponds.

This soil generally is unsuited to cultivated crops and to windbreaks and environmental plantings. The ponding is a hazard.

This soil is suited to tame pasture and hay but the choice of pasture plants is tim ted because natural drainage is restricted. Western wheatgrass is the best suited pasture plant. Other suitable species are Garrison creeping foxtar and reed canarygrass.

The capability until is Vw-4. Closed Depression range site.

La—Lane sitty clay loam. This deep moderately well drained nearly leve soil is on low terraces and flood plains. It is subject to rare flooding. Areas are 15 to 300 acres in size and are mostly irregular in shape. Slopes generally are smooth.

Typically the surface soil is dark gray sitty clay loam about 8 nches thick. The subsoil is about 25 inches thick it is dark gray dark grayish brown and grayish brown firm sitty clay loam and sitty clay. In the lower part it is calcareous is motted and has accumulations of lime. The underlying material to a depth of 60 inches is grayish brown and light brownish gray calcareous sitty clay loam and clay it has accumulations of time. Throughout it is mottled in the upper part it has nests of gypsum in the lower part.

Included with this soil in mapping are small areas of Bon Durrstein Egas and Farmsworth soils. These soils make upless than 25 percent of any one mapped area. Bon soils contain less clay throughout than the Lane soil. They are in positions on the landscape similar to those of the Lane soil. Durrstein Egas, and Farmsworth soils are slightly lower on the landscape than the Lane soil. Durrstein and Farmsworth soils have a sodium affected subsoil. Egas, soils contain more saits, throughout than the Lane soil.

Fertility and the content of organic matter are high in the Lane soil. Tith is fair. Available water capacity is moderate or high. Permeability is moderately slow. Runoff is slow. The shrink swell potential is high.

About haif of the acreage is cropiand. This soil is suited to cultivated crops and to tame pasture and hay Examples of suitable pasture plants are alfalfa, green need egrass intermediate whoatgrass smooth bromegrass, and western wheatgrass. Measures that conserve moisture and improve tith are the main management needs in cultivated areas. Examples are including grasses and legumes in the cropping system, minimizing Illage, and baying crop residue on the surface. Chise ingler subsoiling improves bith and increases the rate of water intake.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely determent of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well except for those that require an abundant supply of moisture.

The capability unit is 1 s-1. Clayey range site.

L1—Lane-Farmsworth sitt loams. These deep nearly level so is are on flood plains and stream terraces. The moderately well drained value soil is on slight rises. The somewhat poorly drained Farmsworth soil is in small shallow depressions. Both so is are subject to rate flooding. Areas are 10 to more than 100 acros in size and are irregular in shape. They are about 40 to 50 percent value soil and 30 to 40 percent Farmsworth soil. The two soils occur as areas so closely intermingled or so small that mapping them superately is not practical.

Typically the surface soil of the Lane soil is dark gray silty cray loam about 6 inches thick. The subsoil is about 25 inches thick it is dark gray dark gray shiprown and grayish brown firm silty cray foam and silty cray in the tower part it is calcareous is motted and has accumulations of time. The underlying materia to a depth of 60 inches is grayish brown and light brownish gray calcareous silty clay loam and cray. If has accumulations of time throughout it is mothed in the upper part, it has nests of gypsum in the lower part.

Typicary The surface aver of the Farmsworth soil is gray silt loam about 5 inches thick. The subsurface aver is light gray silt loam about 3 inches thick. The subsoil is dark gray and dark gray ship brown very firm silty clay about 31 inches thick in the lower part I is calcareous and has visible saits. The underlying material to a depth of 60 inches is gray ship brown and light brownish gray mottled calcareous silty diay loam. It has visible saits in the upper part.

Included with these soils in mapping are small areas of Bon Duristein Egas and Ree soils. These included soils make up less than 25 percent of any one mapped area. Bon soils do not have a sodium affected subsoil and contain less clay throughout than the Lane soil. They are in positions on the landscape similar to those of the Lane soil. The poorly drained Duristein and Egas soils are on the lower parts of the flood plains. The well drained Reo soils are on terraces.

Ferti ty is high in the Lane soil and medium in the Farmsworth soil. The content of organic matter is high in the Lane soil and moderate in the Farmsworth soil. The Farmsworth soil has a sodium affected subsoil that restricts root penetration. Tith is fair in the Lane soil and poor in the Farmsworth soil. Available water capacity is moderate or high in both soils. Permeability is moderately slow in the Lane soil and slow or very slow in the Farmsworth soil. A seasonal high water table is at a depth of 3 to 6 feet in the Farmsworth soil. Bunoff is slow. The shrink swell potential is high.

About half of the acreage is cropland. These soils are suited to cultivated crops, but the sodium affected subsoil in the Farmsworth soil can restrict the penetration of plant roots. Early maturing small grain is

better suited than corn. Tilling when the noils are wet causes surface compaction. Measures that improve tilth increase the rate of water intake, and conserve moisture are the main management needs. Examples are minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system. Subsoiling or chiseling helps to break up the claypair subsoil in the Farmsworth soil and increases the rate of water intake for a short time.

These so is are suited to tame pasture and hay but the choice of pasture plants is limited by the claypan subson in the Farmsworth soil. Examples of suitable pasture plants are attaits, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, and western wheatgrass. Deterred grazing during well periods helps to prevent surface compaction.

No major hazards or limitations affect the use of these soils for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity. Many areas of the Farmsworth soil are potential sites for excavated ponds.

These soils are suited to windbreaks and environments plantings but the dense claypan subsod in the Farmsworth soil severely limits root penetration. All climatics by suited trees and shrubs grow well on the Lane soil except for those that require an abundant supply of moisture. Plantings can be established on the Farmsworth soil, but optimum growth, survival, and vigor are unlikely.

The Lane soil is in capability unit fis-1, Clayey range site, the Farmsworth soil is in capability unit IVs-2. Claypan range site.

LoA—Lowry silt loam, 0 to 2 percent slopes. This deep, well drained nearly level soil is on uplands. Areas are 10 to more than 200 agres in size and are irregular in shape. Slopes are long and smooth.

Typically the surface layer is grayish brown silt loam about 7 inches thick. The subsoil is grayish brown and brown very friable silt loam about 13 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale brown, calcareous silt loam and loam. In places time is closer to the surface, in some areas the soil contains more clay throughout. In other areas it is dark to a depth of more than 20 inches.

Included with this sor in mapping are small areas of Dorna soils. These soils make up less than 10 percent of any one mapped area. They are undertain by clayey material at a depth of 20 to 40 inches. They are in positions on the landscape similar to those of the Lowry soil.

Fertility is medium and the content of organic matter moderate in the Lowry soil. Titth is good. Available water capacity is high. Permeability is moderate. Bunoff is stow.

Most of the acreage is cropland. Some areas are impated. This soil is suited to cultivated crops and to

tame pasture and hay. Examples of suitable pasture plants are aliada, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture and help to control wind erosion are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and including grasses and regumes in the cropping system.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing fielp to maintain maximum productly ty

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture.

The capability unit is IIc-2; Sitty range site.

LoB—Lowry silt loam, 2 to 6 percent slopes. This deep well drained gently sloping soil is on uplands. Areas are 25 to more than 300 acres in size and are gregular in shape. Slopes generally are long and smooth.

Typically the surface layer is grayish brown sill foam about 7 inches thick. The subsoil is grayish brown and brown, very fnable silt loam about 13 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale brown, calcareous silt loam and loam, in some areas the soil contains more clay throughout. In other areas it is dark to a depth of more than 20 inches. In places time is closer to the surface

Included with this soil in mapping are small areas of Dorna soils. These soils make up less than 10 percent of any one mapped area. They are undertain by clayey material at a depth of 20 to 40 inches. They are in positions on the landscape similar to those of the Lowry soil.

Ferbity is medium and the content of organic matter moderate in the Lowly soi. Trith is good. Available water capacity is high. Permeability is moderate. Runoff is medium.

Most of the acreage is cropland. Some areas are impated. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are a falfa intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture and help to control erosion are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Contour farming, grassed waterways, and terraces can help to control arosion.

No major hazards or limitations affect the use of this soll for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of

moisture. Planting on the contour helps to control erosion.

The capability unit is IIe-1, Silty range site

LvA—Lowry Variant sitt loam, 0 to 2 percent slopes. This well drained, nearly level soil is on terraces. It is moderately deep over sandy material. Areas are 10 to 500 acres in age and are irregular in shape. Slopes are smooth.

Typically, the surface layer is grayish brown silt loam about 7 inches thick. The subsoil is grayish brown and brown very fitable silt loam about 9 inches thick. It is calcareous in the lower part. The upper part of the underlying material, to a depth of about 36 inches. Is pale brown and light gray, calcareous loam, very fine sandy loam, and loamy very line sand. The lower part to a depth of 60 inches is light brownish gray calcareous line sand and sand. In some areas the underlying material contains less sand. In other areas it is gravely in places the soil is dark to a depth of more than 20 inches.

Fortility is medium, and the content of organic maller is moderate. Titth is good, Because of the porous underlying material, root development is limited and the soil is somewhat droughty. Available water capacity is low or moderate. Permoability is moderate in the upper part of the soil and moderately rapid in the underlying material. Runoff is slow.

Most of the acreage is cropland. Many areas are singaled. This soil is suited to cultivated crops, but it is droughty. It is better suited to small grain than to corn. Measures that conserve moisture are the main management needs. Examples are leaving crop residue on the suitace and min mixing billage.

This soil is suited to tame pasture and hay. Only those grasses that are drought resistant, however, are suitable Crested wheatgrass and pubescent wheatgrass are examples.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings, but the droughtiness is a limitation. Trees and shrubs can be established, but optimum growth survival and vigor are unlike y

The capability unit is Ills-2; Silty range site

EvB—Lowry Variant ailt loam, 2 to 6 percent siopes. This well drained, undulating soil is on uplands. It is moderately deep over sand. Areas as 10 to 300 acres in size and are progular in shape. Stopes are slightly convex.

Typically, the surface layer is grayish brown sitt loam about 7 inches thick. The subsoil is grayish brown and brown, very frable sitt loam about 9 inches thick. It is calcareous in the lower part. The upper part of the

underlying material, to a depth of about 36 inches, is pale brown and light gray, calcareous loam, very line sandy loam, and loamy very fine sand. The lower part to a depth of 60 inches is light brownish gray, calcareous fine sand and sand. In some areas the underlying material contains less sand, in other areas it is gravely in places the soil is dark to a depth of more than 20 inches.

Fertility is medium, and the content of organic matter is moderate. Tilth is good. Because of the porous underlying material root development is limited and the soil is somewhat droughtly. Available water capacity is low or moderate. Permeability is moderate in the upper part of the soil and moderately rapid in the underlying material. Runoff is medium.

Most of the acreage is cropland. Many sreas are impated. This soil is suited to cultivated crops, but it is somewhat droughty. It is better suited to small grain than to corn. Measures that help to control erosion and conserve moisture are the main management needs. Examples are leaving crop residue on the surface and minimizing tileage.

A cover of tame pasture or hay is effective in controlling erosion. This soil is suited to tame pasture and hay. Only those grasses that are drought resistant, however, are suitable. Examples are crested wheatgrass and pubescent wheatgrass.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely determent of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings, but the droughtiness is a limitation. Trees and shrubs can be established, but optimum growth, survival, and vigor are unlikely. Planting on the contour helps to control erosion.

The capability unit is Ille-6; Silty range site.

Ma8—McClure slit loam, 2 to 6 percent slopes. This deep we drained gently sloping soil is on up ands. Areas are 10 to 100 acres in size and are irregular in shape. Slopes are smooth and alightly convex.

Typically the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is about 23 inches thick it is dark grayish brown fnable silt loam in the upper part dark grayish brown fnable, calcareous silty day loam in the next part and light brownish gray, firm, calcareous silty day in the lower part. It has accumulations of lime in the middle and lower parts. The underlying material to a depth of 60 inches is grayish brown, calcareous silty day. It has accumulations of lime throughout in places the subsoil is silty day.

Included with this sor in mapping are small areas of Promise and Uty sors. These soils make up less than 25 percent of any one mapped area. They are in positions on the landscape similar to those of the McClure soil.

Promise soils are clayey throughout. Uty soils are sity throughout.

Ferbity is medium and the content of organic matter moderate in the McClure soil. Titth is good. Available water capacity is moderate or high. Permeability is moderately slow in the subsoil and slow in the underlying material. Runoff is medium. The shrink-swell potential is high.

About half of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that help to control erosion and conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface minimizing tiliage, and including grasses and legumes in the cropping system. Contour farming helps to control erosion.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow walk, except for those that require an abundant supply of moisture. Planting on the contour helps to control erosion.

The capability unit is lie-1; Silty range site.

MaC—McClure slif loam, 6 to 11 percent slopes. This deep well drained moderately sloping soil is on uplands. Areas are 10 to 200 acres in size and are irregular in shape. Slopes generally are convex.

Typically the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is about 23 inches thick it is dark grayish brown finable sill loam in the upper part dark grayish brown finable calcareous silty clay dark in the lower part it has accumulations of lime in the middle and lower parts. The underlying material to a depth of 60 inches is grayish brown, calcareous sity day. It has accumulations of lime throughout in places the subsoil is sity clay.

Included with this soil in mapping are small areas of Opal and Uly soils. These soils make upliess than 20 percent of any one mapped area. They are in positions on the landscape similar to those of the McClure soil. Opal soils are clayey throughout and are 20 to 40 inches deep to shale. Jiy soils are sitly throughout.

Fertility is medium and the content of organic matter moderate in the McClure soil. If this good Available water capacity is moderate or high Permeability is moderately slow in the subsoil and slow in the underlying material. Buriott is medium. The shrink swell potential is high.

Most of the acreage supports native grasses and is used for grazing. No major hazards or limitations affect

the use of this soil for range, however, water erosion is a hazard if the range is overgrazed. Gullies form along some cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent guillying.

This soil is suited to cultivated crops. Examples of suitable pasture plants are alialfa, intermediate wheatgrass, and smooth bromegrass. Measures that help to control erosion are the main management needs in cultivated areas. Examples are leaving crop residue on the surface minimizing tillage, and including grasses and legumes in the cropping system. Contour farming, grassed waterways, and terraces can help to control erosion.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well except for those that require an abundant supply of moisture. Planting on the contour helps to control erosion.

The capability unit is life-2; Silty range site

MbA—Millboro sitty clay loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on uplands. When dry it is characterized by cracks which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Areas are 80 to more than 300 acres in size and are irregular in shape. Slopes are smooth.

Typically the surface layer is dark grayish brown silty clay loam about 5 inches thick. The subsoil is dark grayish brown and grayish brown, firm and very firm silty clay about 31 inches thick. In the lower part it is calcareous and has accumulations of lime. The underlying material to a depth of 60 inches is light olive brown calcareous silty clay it has accumulations of lime throughout. It has accumulations of salts in the lower part in places the soil is dark to a depth of more than 20 inches.

Fertility is medium, and the content of organic matter is moderate. Toth is fair. Available water capacity is moderate. Permeability is slow. Runoff also is slow. The shrink-swell potential is high.

Most of the acreage is cropland. This soil is auted to cultivated crops and to tame pasture and hay (fig. 6). Examples of suitable pasture plants are attails intermediate wheatgrass, and smooth bromegrass. Measures that improve title and conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the suitace and including grasses and legumes in the cropping system. Chiseling or subsoiling improves title and increases the rate of water intake for a short time. Stripcropping and field windbreaks help to control wind erosion.

If this soil is used for range compaction is a problem Hestricted grazing during well periods helps to prevent surface compaction and detenoration of tith



Figure 6.—Newty mown hay in an area of Millboro sitty clay loam, 0 to 2 percent alopes. An area of Sansarc-Opal clays, 12 to 20 percent alopes, in in the background.

This soil is suited to windbreaks and environmental plantings, however, it takes in water slowly and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimizing growth is unlikely

The capability unit is Ilis-3; Clayey range site

MbB—Millboro silty clay loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on uplands. When dry, it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Areas are 10 to 100 acres in size and are irregular in shape. Slopes are long and smooth.

Typically, the surface layer is dark grayish brown silty clay loam about 5 inches thick. The subsoil is dark grayish brown and grayish brown, firm and very firm silty clay about 31 inches thick. In the lower part it is

calcareous and has accumulations of lime. The underlying material to a depth of 60 inches is light olive brown, calcareous sity clay. It has accumulations of lime throughout. It has accumulations of saits in the lower part. In places the soil is dark to a depth of more than 20 inches.

Fertility is medium, and the content of organic matter is moderate. Tilth is fair. Available water capacity is moderate. Permeability is slow. Runoff is medium. The shrink-swell potential is high.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are aifaifa, intermediate wheatgrass, and smooth bromegrass. Measures that help to control erosion and improve tilth are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and including grasses and regumes in the cropping system. Chiseling

or subsoiling improves tith and increases the rate of water intake for a short time. Contour farming helps to control water erosion. Stripcropping and field windbreaks help to control wind erosion.

If this soil is used for range, compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tith.

This sort is suited to windbreaks and environmental plantings, however, it takes in water slowly and the clayer subsoil can restrict the penetration of plant roots. Windbreaks can be established but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is Ille-4, Clayey range site.

MbC-Miliboro sitty clay loars, 6 to 9 percent slopes. This deep, well drained, moderately sloping soil is on uplands. When dry it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Areas are 10 to 80 acres in size and are irregular in shape. Slopes are smooth.

Typically the surface layer is dark grayish brown sity cay loam about 5 inches thick. The subsoil is dark grayish brown and grayish brown, firm and very firm sitty clay about 31 inches thick. In the lower part it is calcareous and has accumulations of lime. The underlying material to a depth of 60 inches is light olive brown calcareous sitty clay. It has accumulations of lime throughout. It has accumulations of salts in the lower part. In some places, the soil is dark to a depth of more than 20 inches. In other places shall bedrock is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of Okaton soils on ridges. These soils make up less than 10 percent of any one mapped area. They are 8 to 20 inches deep to shale.

Fertity is medium and the content of organic matter moderate in the Millboro soil. Tilth is fair Available water capacity is moderate. Permeability is slow. Runoff is medium. The shrink swell potential is high.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tith. Water erosion is a hazard if the range is overgrazed. Gulkes form along some cattle trails. Fencing and other means of controlling aveslock traffic patterns help to prevent gut ving.

This soil is suited to cultivated crops and to tame pasture and hay Examples of suitable pasture plants are alfalfa, infermediate wheatgrass, and smooth bromegrass. Measures that help to control erosion and improve tith are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Chiseling or subsoiling improves tith and increases the rate of water intake for a short time.

Contour farming, grassed waterways, and terraces can help to control erosion

This soil is suited to windbreaks and environmental plantings however it takes in water slowly and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IVe-4. Clayey range site.

MoA—Mobridge sitt loam. This deep moderately well drained, nearly level soil is in swares. It is occasionally flooded for very bnet periods. Areas are 10 to more than 200 acres in size. They are long and narrow or are irregular in shape. Slopes are smooth and are plane or concave.

Typically the surface soil is very dark grayish brown silt loam about 14 nohes thick. The subsoil is dark grayish brown grayish brown, and light brownish gray trable and firm silty clay loam about 23 inches thick in the lower part it is calcareous and has accumulations of time. The underlying materia to a depth of 60 inches is light yellowish brown calcareous silty clay loam it has accumulations of time throughout in some areas the subsoil contains more clay. In other areas it contains more sand in places visible salts are in the underlying material.

Included with this soil in mapping are small areas of Beadle Eakin. Highmore and Plankinton soils. These soils make up less than 25 percent of any one mapped area. The well drained Beadle Eakin, and Highmore soils are on the higher parts of the landscape. The poorly drained Plankinton soils are in depressions.

Fert ity and the content of organic matter are high in the Mobridge soil. Tilth is good. Available water capacity is high Permeability is moderate. Runoff is slow. The shrink swell potential is moderate.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture during dry periods are the main management needs in cultivated areas. Leaving crop residue on the surface and including grasses and tegumes in the cropping system are examples. In some years heldwork is delayed because the soil receives runoff from adjacent soils, but in most years the additional moisture is beneficial.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. A, camatically suited trees and shrubs grow well. Those that require an abundant supply of moisture grow especially well.

The capability unit is lic-3; Overflow range site

Mp—Mobridge-Plankinton silt loams. These deep level and nearly level soits are in swales and depressions in the uplands. The moderately well drained Mobridge soil is in swales. It is occasionally flooded for brief periods. The poorly drained Plankinton soil is in the lowest parts of swales and in depressions within the swales it is ponded during periods of heavy fainfall or rapid snowmelt. Areas are 10 to more than 200 acres in size. They are long and narrow or are irregular in shape. They are about 50 to 70 percent Mobridge soil and 20 to 40 percent Plankinton soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically the surface soil of the Mobridge soil is very dark grayish brown sitt loam about 14 nohes thick. The subsoil is dark grayish brown grayish brown, and light brownish gray. Inable and firm sitty clay loam about 23 inches thick. In the lower part it is carcareous and has accumulations of time that extend into the underlying material. The underlying material to a depth of 60 inches is light yellowish brown calcareous sitty day loam. It has accumulations of time throughout in places the subsoil contains more day.

Typically the surface ayer of the Plankinton soil is dark gray silt loam about 4 inches thick. The subsurface layer a gray silt loam about 2 inches thick. The subsoil is dark gray very firm silly clay about 33 inches thick in the lower part it has accumulations of time and gypsum that extend into the underlying material. The underlying material to a depth of 60 inches is grayish brown. Calcareous silty clay and silty clay loam. It is moltled in the lower part. In places the subsoil has been affected by a high content of sodium.

Included with these soils in mapping are small areas of the well drained Eakin and Highmore soils on higher parts of the landscape. These included soils make up less than 15 percent of any one mapped area.

Perliity is high in the Mobridge soil and medium in the Plankinton soil. The content of organic matter is high in both soils. Tith is good in the Mobridge soil and poor in the Plankinton soil. Available water capacity is high in the Mobridge soil and moderate in the Plankinton soil. A seasonal high water lable is within a depth of 1 fool in the Plankinton soil. As much as 1 foot of water ponds on this soil during some wet periods. Permeability is moderate in the Mobridge soil and very slow in the Plankinton soil. Flankinton soil. The shrink swell potential 5 moderate in the Mobridge soil and high in the Plankinton soil.

About half of the acreage is cropland. These soils are suited to cultivated crops and to tame pasture and hay Examples of suitable pasture plants are alta fail intermediate wheatgrass, and smooth bromegrass. Gamson creeping fortail and reed canarygrass are suited to the Plankinton soil Improving the trith of the Plankinton soil and controlling the pending on that soil.

are the main concerns in managing cultivated areas. Returning crop residue to the soils and de aying tillage when the soils are wet improve tilth. Surface drains and measures that divert the runoff from adjacent soils help to remove the excess water.

No major hazards or limitations affect the use of the Mobilde soil for range. Compaction and ponding are problems on the Plankinton soil. Restricted grazing during well periods helps to prevent surface compaction and deterioration of tith. Many areas of the Plankinton soil are potential sites for excavated ponds.

The Mobridge soil is suited to windbreaks and environmental prantings but the Plankinton soil generally is unsuited. A crimal cally suited trees and shrubs grow well on the Mobridge soil. Those that require an abundant moisture supply grow especially well. No trees or shrubs grow well in undrained areas of the Plankinton soil.

The Mobridge soil is in capability unit I c 3. Overflow range site. The Plankinton soil is in capability unit IVw 1, Closed Depression range site.

On—Oahe loam, 0 to 2 percent slopes. This well drained nearly level son is on terraces. It is moderately deep over sandy and grave ly materia. Areas are 10 to 100 acres in size and are irregular in shape. Slopes are smooth.

Typically the surface layer is dark grayish brown loam about 4 inches thick. The subsoil is about i0 inches thick. It is dark grayish brown. Inable loam and I im clay loam. The upper 10 inches of the underlying materia is grayish brown calcareous loam. The lower part to a depth of 60 inches is multicolored, calcareous grave, y loamy sand in some places the soil is dark to a depth of more than 20 inches, in other places the gravelly material is at a depth of 14 to 20 inches.

Included with this soil in mapping are small areas of flee soils. These soils make up less than 20 percent of any one mapped area. They do not have gravely material within a depth of 40 inches. They are in positions on the landscape similar to those of the Oahe soil.

Fertility is medium and the content of organic matter moderate in the Oahe soi. Tith is good. Available water capacity is low. Permeability is moderate in the upper part of the soil and rapid in the underlying materia. Runoff is slow.

About hait of the acreage is cropiand. This soil is suited to cultivated crops, but it is droughty. It is better suited to small grain than to corn. Measures that conserve moisture are the main management needs. Examples are leaving crop residue on the surface and including grasses and regumes in the cropping system.

No major hazards or imitations affect the use of this soil for range. Proper stocking rates and timely determent of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings but the droughtiness is a limitation. Trees and shrubs can be established, but optimum growth survival, and vigor are unlikely.

This soil is a probable source of sand and gravel. The capability unit is Ills-2; Sity range site.

OdB—Dahe-Deimont loams, 2 to 6 percent slopes. These undulating soils are on terraces. The well drained Oahe soil is moderately deep over sandy and gravelly material. It is on the lower side slopes. The somewhat excessively drained Delmont soil is shallow over gravelly material. It is on knotis and ridges. Areas are 10 to 250 acres in size and are irregular in shape. They are about 40 to 50 percent Oahe soil and 35 to 45 percent. Delmont soil. The two soils occur as areas so closely interminished or so small that mapping them separately is not practical.

Typically, the surface layer of the Oahe soil is dark grayish brown loam about 4 inches thick. The subsoil is about 10 inches thick. It is dark grayish brown, fnable loam and lirm day loam. The upper 10 inches of the underlying material is grayish brown calcareous loam. The lower part to a depth of 60 inches is multicolored. Calcareous gravelly loamy sand. In some places the subsoil contains more day. In other places the soil is dark to a depth of more than 20 inches.

Typically the surface layer of the Delmont soil is dark grayish brown loam about 4 inches thick. The subsoil is dark gray fnable calcareous loam about 12 inches thick. The underlying material to a depth of 60 inches is multicolored calcareous gravelly sand it has accumulations of time in the upper part. In places the gravelly sand is at a depth of less than 14 inches.

included with these soils in mapping are small areas of Ree soils. These included soils make upliess than 20 percent of any one mapped area. They do not have gravelly material within a depth of 40 inches. They are in the smoother areas.

Fertility is medium and the content of organic matter moderate in the Dahe and Delmont soils. Tidth is good Available water capacity is low. Permeability is moderate in the upper part of the profile and rapid in the gravelly underlying material. Bunoff is medium.

About half of the acreage is cropland. These soils are suited to cultivated crops, but they are droughty. They are better suited to small grain and grasses than to late maturing crops, such as corn. Measures that help to control erosion and conserve moisture are the main management needs. Examples are leaving crop residue on the surface, minimizing tillage, and including grasses and legumes in the cropping system.

A cover of tame pasture plants or hay is effective in controlling erosion. These soils are suited to tame pasture and hay but productivity is limited because of the droughtness. Only drought-resistant plants are

suitable. Examples of suitable pasture plants are crested wheatgrass and pubescent wheatgrass.

No major hazards or limitations affect the use of these soils for range. Productivity is limited however because the Delmont soil is droughty.

These soils are suited to windbreaks and environmental planting but the droughtiness is a limitation. Trees and shrubs can be established but optimum survival, growth, and vigor are unikely.

These soils are a probable source of sand and gravel. The Oahe soil is in capability unit life-6. Stily range site, the Delmont soil is in capability unit IVe-6, Shallow to Gravel range site.

Oef—Okaton bouldery sitty clay, 15 to 40 percent slopes. This shallow, well drained, moderatery steep and steep son is on uplands. Areas are 50 to more than 400 acres in size and are irregular in shape. Slopes are mostly convex. A rimrock of hard sandstone is at the highest elevations. Scattered stones and boulder sized pieces of this outcrop commonly are on the surface. Landslides have occurred in some areas.

Typically the surface layer is grayish brown, calcareous bouldery silty clay about 1 inch thick. The next layer is grayish brown and light yellowish brown, firm calcareous silty clay about 3 inches thick. The underlying material is light ye lowish brown and light olive brown calcareous clay and shally clay Light brownish gray and pale ye low calcareous shale is at a depth of about 16 inches. Gypsum and other salts are in the seams of the shale in some places the depth to shale is more than 20 inches in other places fewer boulders are on the surface.

Included with this soil in mapping are small areas of the deep loamy Betts and Java soils and soils that formed in silty or sandy material. These soils make upliess than 25 percent of any one mapped area. Betts and Java soils are in positions on the landscape similar to those of the Okalon soil.

Fertility and the content of organic matter are low in the Okaton son. Tilth is poor. Available water capacity is very low. Permeability is slow. Runoff is rapid. The shink swell potential is high.

All areas of this son support native grasses and are used for grazing. Water erosion is a hazard on this moderately steep and steep sor unless an adequate plant cover is maintained. Reestablishing vegetation is difficult in denuded areas. Guilles form along some cattle trails.

This soil is too steep and too bouldery for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings

The capability unit is Vile-8, Shallow range site

OkB-Oko loam, 2 to 7 percent slopes. This deep well drained, undulating soil is on uplands. Areas range from 10 to 150 acres in size and are irregular in shape.

Slopes are smooth or slightly convex. Scattered stones commonly are on the surface.

Typically the surface eyer is dark gray loam about 5 inches thick. The subsoil is dark grayish brown and grayish brown firm day about 18 inches thick in the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is light olive gray calcareous day it has visible satts in the lower part. In some places the subsoil contains less day in other places the depth to lime is less than 5 inches.

Included with this sow in mapping are small areas of Cavo Gienham. Java, and Promise soils. These soils make upless than 25 percent of any one mapped area. Cavo soils have a sodium affected subsoil. They are in small depressions on the lower side slopes. Glenham and Java soils are slightly higher on the landscape than the Oko soil. Also, they have less dray in the control section. Promise soils contain more day in the subsoil than the Oko soil. They are on the lower parts of the landscape.

Fertility is medium and the content of organic matter moderate in the Oko soil. Tith is fair. Available water capacity is moderate. Permeability is slow. Runoff is medium. The shrink-swell potential is high.

About half of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay Examples of suitable pasture plants are alfalfa, green needlegrass, intermediate wheatgrass, smooth bromegrass, and western wheatgrass. Measures that help to control erosion improve tilth, and conserve moisture are the main management needs in cultivated areas. Examples are minimizing titlage, leaving crop residue on the surface, and including grasses and legumes in the cropping system. Chiseling, or subsolving improves bith and increases the rate of water intake for a short time.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and limiting deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings however it takes in water slowly and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is II e-4. Clayey range site.

OmB—Opal sitty ciay, 2 to 6 percent alopes. This moderately deep, well drained gently sloping soil is on uplands. When dry it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several leet long and extend through the subsoil Areas are 10 to more than 100 acres in size and are irregular in shape. Slopes are mostly smooth and convex. A few small pebbles are on the surface in most areas.

Typically the surface layer is gray sity dray about 5 inches thick. The subsoil is grayish brown very firm day about 17 inches thick. It is calcareous in the lower part. The underlying material is light brownish gray, mottled, calcareous dray it has accumulations of lime throughout light gray shale bedrock is at a depth of about 37 inches. In some places the depth to shale is more than 40 inches. In other places the soil is more saline.

Included with this soil in mapping are small areas of Chantier soils. These soils make up about 10 percent of most mapped areas. They are less than 20 inches deep to shale and contain more sails throughout than the Opar soil. Also, they are sightly lower on the landscape.

Fertility is medium and the content of organic matter moderate in the Opal soil. Tith is poor. Available water capacity is low. Permeability is very slow. Runoff is medium. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction is a problem Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tith.

This soil is suited to tame pasture and hay Examples of suitable pasture plants are affalia, infermediate wheatgrass, and smooth bromegrass.

This soil is suited to cultivated crops. It is subject to surface compaction if thied when well and cannot be easily thied when dry. Measures that improve this, conserve moisture, and help to control erosion are the main management needs. Examples are leaving crop residue on the surface minimizing tillage, and including grasses and legumes in the cropping system. Stippcropping and field windbreaks help to control wind erosion. Contour farming, grassed waterways, and terraces help to control water erosion, but the alopes in some areas are too short or too irregular for contouring and terracing.

This soil is suited to windbreaks and environmental plantings however it takes in water slowly and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established but optimizing growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is Ille-4, Clayey range site.

Omc—Opal sitty ctay, 5 to 11 percent slopes. This moderately deep, well drained, moderately sloping and strongly sloping soil is on uplands. When dry, it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil Areas are 25 to more than 200 acres in size and are irregular in shape. Slopes are smooth and convex. A few scattered stories commonly are on the surface.

Typically the surface layer is gray sity clay about 5 inches thick. The subsoil is grayish brown very firm clay about 17 inches thick. It is calcareous in the lower part. The underlying material is light brownish gray mothed, calcareous clay. It has accumulations of time throughout Light gray shale bedrock is at a depth of about 37.

inches, in some areas the depth to shale is more than 40 inches.

Included with this soil in mapping are small areas of Bullcreek, Chantier, Hurley, and Sansarc soils. These soils make up less than 25 percent of any one mapped area. Bullcreek soils contain more sails than the Opal soil and are more than 40 inches deep to shale. They are near drainageways. Chantier and Sansarc soils are less than 20 inches deep to shale. Chantier soils are lower on the landscape than the Opal soil. Sansarc soils are on ndges. Hurley soils have a sodium affected subsoil. They are on foot slopes.

Fertility is medium and the content of organic matter moderate in the Opal soil. Tilth is poor. Available water capacity is low. Permeability is very slow. Bunoff is medium. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth. Water erosion is a hazard if the range is overgrazed. Gullies form along some cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

This so is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are affails, intermediate wheatgrass, and smooth bromegrass. The soil is subject to surface compaction if billed when wet and cannot be easily tilled when dry Measures that help to control erosion and improve tith are the main management needs in cultivated areas. Examples are including grasses and legumes in the cropping system, minimizing tillage, and leaving crop residue on the surface. Contour farming, grassed waterways, and terraces can help to control erosion, but the slopes in some areas are too short or too irregular for contouring and terracing

This soil is suited to windbreaks and environmental plantings; however, it takes in water slowly and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IVe-4, Clavey range site.

OpB—Opal clay, saline, I to 6 percent slopes. This moderately deep, well drained, undulating soil is on uplands. Areas are 40 to 150 acres in size and are irregular in shape. Slopes are long and are characterized by slight microrelief.

Typically, the surface layer is dark grayish brown clay about 4 inches thick. The subsoil is dark grayish brown, very firm clay about 15 inches thick. In the lower part it has accumulations of gypsum and other salts. The underlying material is grayish brown clay. It has nests of gypsum and accumulations of time throughout. Grayish brown shale bedrock is at a depth of about 24 inches. In

some places the shale is within a depth of 20 inches. In other places the content of salts is lower

Included with this soil in mapping are small areas of Hurley soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area, Hurley soils have a sodium affected subsoil. They are in positions on the landscape similar to those of the Opal soil. Slickspots have a puddled surface and do not support vegetation. They occur in a random pattern throughout the mapped areas.

Fertility and the content of organic matter are low in the Opal soil. The soil is slightly affected by saits. Titth is poor. Available water capacity is low or very low. Permeability is very slow. Runoff is medium. The shinkswell potential is very high.

Nearly all areas support native grasses and are used for grazing or hay. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth. If the range is overgrazed, the extent of bare areas or Skckspots increases. Establishing vegetation is difficult in denuded areas.

Because of the salinity and the density of the subsoil, this soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The capability unit is Vis-5; Dense Clay range site.

Or—Orthents, loamy. This map unit consists of soils in and near open excavations from which sand and gravel have been removed. Areas are 5 to more than 40 acres in size and irregular in shape. Slopes are uneven and broken. They range from nearly level on the pit bottoms to almost vertical on the sides.

The pit bottoms are dominantly gravetly sandy loam. In areas where all the sand and gravet has been removed, however, they are loam or clay loam glacial till. Mounds of mixed loamy overburden are on the edges of the areas. The bottoms and sides of the excavations support little or no vegetation during periods when graver is being removed.

Included with these soils in mapping are small areas of Delmont, Oahe, Orton, and Schamber soils. These included soils make up less than 25 percent of any one mapped area. They are in unexcavated areas. Delmont soils are 14 to 20 inches deep over graveily material. Oahe and Orton soils are 20 to 40 inches deep over graveily material, and Schamber soils are less than 10 inches deep over graveily material. Pits where graveils being removed are also included in mapping.

Most of the acreage is used only as a source of sand and gravel. Some areas provide limited widdle habitat Abandoned excavations can be restored to range tame pasture, or cropland if reclamation measures are applied. These measures include shaping the areas and using the mounds of overburden material as topsoil. Applying ferblizer as needed helps to establish the range or pasture.

The capability unit is Vills-2; no range site is assigned.

OtA—Orton loam, 0 to 2 percent slopes. This well drained, nearly level soil is on terraces. It is moderately deep over gravelly sand. Areas are 20 to several hundred acres in size and are irregular in shape. Slopes are smooth.

Typically, the surface layer is dark grayish brown loam about 6 inches thick. The subsoil is dark grayish brown and grayish brown, very friable loam about 16 inches thick. In the lower part it is calcareous and has accumulations of time. The upper 15 inches of the underlying material is light brownish gray and pale brown, calcareous fine sandy loam. It has accumulations of time throughout. The lower part to a depth of 60 inches is multicolored, calcareous very gravelly sand. In places the subsoil contains more clay

Included with this soil in mapping are small areas of Lowry, Lowry Variant, and Millboro soils. These soils make up less than 20 percent of any one mapped area. They are in positions on the landscape similar to those of the Orton soil. They do not have gravelly material within a depth of 40 inches. Also, the Millboro soils are

clavey throughout.

Fertility is medium and the content of organic matter moderate in the Orion soil. Tith is good. Available water capacity is low or moderate. Permeability is moderately rapid in the upper part of the soil and rapid in the

underlying material. Runoff is slow

Most of the acreage is cropland. This soil is suited to cultivated crops, but it is somewhat droughty. It is better suited to small grain than to com, Measures that conserve moisture are the main management needs. Examples are including grasses and legumes in the cropping system, leaving crop residue on the surface, and manimizing tillage.

This soil is suited to tame pasture and hay, but it is droughty Examples of suitable pasture plants are alfalfa, crested wheatgrass, intermediate wheatgrass, and

smooth bromegrass

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings, but the droughtliness is a limitation. Plantings can be established, but optimum growth and vigor are unlikely

This soil is a probable source of sand and gravel. The capability unit is life-7; Sandy range site.

OtB—Orton loam, 2 to 5 percent slopes. This well drained, gently sloping soil is on terraces. It is moderately deep over gravelly material. Areas are 10 to 100 acres in size and are irregular in shape. Slopes are smooth or slightly convex.

Typically, the surface leyer is dark grayish brown foam about 6 inches thick. The subsoil is dark grayish brown and grayish brown, very friable loam about 16 inches thick. In the lower part it is calcareous and has accumulations of lime. The upper 15 inches of the underlying material is light brownish gray and pale brown, calcareous line sandy loam. It has accumulations of lime throughout. The lower part to a depth of 60 inches is multicolored, calcareous very gravelly sand, in places the subsoil contains more clay.

Included with this soil in mapping are small areas of Lowry, Lowry Variant, and Millboro soils. These soils make up less than 20 percent of any one mapped area. They are in positions on the landscape similar to those of the Orton soil. They do not have gravelly material within a depth of 40 inches. Also, the Milboro soils are

clayey throughout.

Fertility is medium and the content of organic matter moderate in the Orton soil. Tilth is good. Available water capacity is low or moderate. Permeability is moderately rapid in the upper part of the soil and rapid in the

underlying material. Flunofi is slow.

Most of the acreage is cropland. This soil is suited to cultivated crops, but it is somewhat droughty. It is better suited to small grain than to corn. Measures that help to control erosion and conserve moisture are the main management needs. Examples are leaving crop residue on the surface, including grasses and legumes in the cropping system, and minimizing tillage.

This soil is suited to tame pasture and hay, but it is droughty. Examples of suitable pasture plants are alfalfa, created wheatgrass, intermediate wheatgrass, and

smooth bromegrass.

No major hazards or limitations affect the use of this soil for range. Proper slocking rates and timely determent of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings, but the droughtiness is a limitation. Trees and shrubs can be established, but optimum growth, survival.

and vigor are unlikely

This soil is a probable source of sand and gravel. The capability unit is lite-8; Sandy range site.

OwE—Orton-Schamber loams, 9 to 25 percent slopes. These strongly sloping and moderately steep soils are on terrace remnants. The well drained Orton soil is on the smooth or slightly convex slopes. The excessively drained Schamber soil is on short, convex slopes. The Orton soil is moderately deep to gravelly material, and the Schamber soil is very shallow to gravelly material. Areas are 40 to more than 100 acres in tizze and generally are long and narrow. They are about 40 to 50 percent Orton soil and 35 to 45 percent. Schamber soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically the surface layer of the Orton soil is dark grayish brown loam about 6 inches thick. The subsoil is dark grayish brown and grayish brown, very friable toam about 6 inches thick. In the lower part t is calcareous and has accumulations of lime. The upper 15 inches of the underlying material is light brownish gray and pale brown calcareous fine sandy loam. It has accumulations of time throughout. The lower part to a depth of 60 inches is multicolored, calcareous very grayerly sand.

Typicarly the surface layer of the Schamber sor is dark grayish brown calcareous foam about 3 inches thick. The underlying material to a depth of 60 inches is multicolored calcareous gravelly loamy sand and gravelly sand. In places the surface layer is thicker.

included with these soils in mapping are small areas of Lowry and Ree soils. These included soils make up less than 20 percent of any one mapped area. The sity Lowry soils and the loamy Ree soils are more than 40 inches deep to gravelly material. Lowry soils generally are on the lower loot slopes. Ree soils generally are on high flats.

Fertility is medium in the Orton soil and low in the Schamber soil. The content of organic matter is moderate in the Orton soil and low in the Schamber soil. Available water capacity is moderate or low in the Orton soil and very low in the Schamber soil. Permeability is moderately rapid in the upper part of the Orton soil and rapid in the gravally underlying material. It is rapid in the Schamber soil. Rurioff is medium on the Orton soil and slow on the Schamber soil.

Most of the acreage supports native grasses and is used for grazing. Water erosion is a hazard on these strongly sloping and moderately steep soils unless an adequate plant cover is maintained. Productivity is limited because the Schamber soil is droughty. Establishing vegetation is difficult in denuded areas.

These soils generally are unsurted to cultivated crops, tame pasture and hay and windbreaks and environmental plantings because of the droughtiness and the slope. They are a probable source of sand and gravel.

The Orton soil is in capability unit Vie-6. Sandy range site the Schamber soil is in capability unit Vis-4. Very Shallow range site.

Pa—Plankinton allt loam. This deep, poorly drained, level soil is in depressions on uplands it is ponded during periods of snowmell or heavy rainfall. Areas are 10 to 100 acres in size and generally are circular or obling.

Typically the aurface layer is dark gray sift loam about 4 inches thick. The subsurface layer is gray sift loam about 2 inches thick. The subsoil is dark gray very firm stily clay about 33 inches thick. In the lower part it has accumulations of time and gypsum that extend into the underlying material. The underlying material to a depth of 60 inches is grayish brown, calcareous sifty clay and sifty.

clay loam. It is mottled in the lower part, in some places the soil has a sodium affected subsoil. In other places it is very poorly drained.

included with this soil in mapping are small areas of the moderatery well drained Mobindge soils in swales. These soils make up less than 10 percent of any one mapped area.

Fertility is medium and the content of organic matter high in the Plankinton soil Tuth is poor Available water capacity is moderate. A seasonal high water table is within a depth of 1 foot most of the year. As much as 1 foot of water ponds on the surface during some wet periods. Permeability is very slow. Runoff its ponded. The shrink swell potential is high.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction and pending are problems. Restricted grazing during well periods helps to prevent surface compaction and deterioration of tith. Many areas are potential sites for excavated pends.

This soil is suited to cultivated crops and to tame pasture and hay but the ponding is a hazard. Examples of suitable pasture plants are Gamison creeping foxtail and reed canarygrass. Measures that improve tith, drainage and the rate of water intake are the main management needs in cultivated areas. Chiseling or subsoiling including grasses and legumes in the cropping system, and installing surface drains are examples.

This soil generally is unsuited to windbreaks and environmental plantings unless it is drained.

The capability unit is IVw-1 Closed Depression range site

PrA—Promise ality clay, 0 to 2 percent slopes. This deep well drained nearly level soil is on uplands faris, and lerraces. When dry it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several leet long and extend through the subsoil. Areas are 20 to several hundred acres in size and are irregular in shape. Slopes generally are smooth. A few small pebbies commonly are on the surface.

Typically the surface layer is dark gray sitty clay about 7 inches thick. The subsoil is dark grayish brown and grayish brown firm and very firm clay about 26 inches thick. In the lower part it is calcareous and has accumulations of time that extend into the underlying material. The underlying material to a depth of 60 inches is grayish brown and light brownish gray calcareous clay it is mottled in the lower part. In places the depth to shale is less than 40 inches.

Included with this soil in mapping are small areas of Buildreek Carter Dorna Hurley and Wendte soils. These soils make up less than 25 percent of any one mapped area. Buildreek Carter, Dorna, and Hurley soils are in positions on the landscape similar to those of the Promise. Buildreek soils have visible sails in the subsoil and are more dense than the Promise soil. Carter

soils have a claypan subsoil. Dorna soils formed in sity material 20 to 40 inches deep over clayey material. Hurley soils have a sodium affected subsoil and are 20 to 40 inches deep over share. The moderately well drained Wendte soils are on narrow flood plains.

Fertility is medium and the content of organic matter moderate in the Promise soil. Titth is poor. Available water capacity is low or moderate. Permeability is very slow. Runoff is slow. The shrink-swell potential is very high.

About half of the acreage is croptand. This soil is suited to cultivated crops and to tame pasture and hay Examples of suitable pasture plants are alfalfa. Intermediate wheatgrass, and smooth bromegrass. The soil is subject to surface compaction if triled when well and cannot be easily tiried when dry. Measures that improve tifth, help to control wind erosion, and conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface, subsoiling or chiseling, and including grasses and legumes in the cropping system. Stripcropping and field windbreaks can help to control wind erosion.

If this soil is used for range, compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of Lith.

This soil is suited to windbreaks and environmental plantings however it takes in water slowly and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely.

The capability unit is II s-3. Clayey range site.

**PrB**—**Promise sitty ctay, 2 to 6 percent slopes.** This deep, well drained, gently sloping soil is on uplands, tans, and terraces. When dry it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feel long and extend through the subsoil. Areas are 20 to severa, hundred acres in size and are irregular in shape. Slopes are smooth or slightly convex. A few small peobles commonly are on the surface.

Typically the surface layer is dark gray sity clay about 7 inches thick. The subsor is dark grayish brown and grayish brown firm and very firm clay about 26 inches thick. In the lower part it is calcareous and has accumulations of time that extend into the underlying material. The underlying material to a depth of 60 inches is grayish brown and light brownish gray calcareous clay it is mottled in the lower part. In some areas the depth to shale is less than 40 inches.

Included with this soil in mapping are small areas of Buildreek and Carter soils. These soils make upliess than 15 percent of any one mapped area. They are in positions on the landscape similar to those of the Promise soil. Buildreek soils have visible sails in the subsoil and are more dense than the Promise soil. Carter soils have a dense claypan subsoil.

Fertility is medium and the content of organic matter moderate in the Promise soil. Titth is poor Available water capacity is low or moderate. Permeability is very slow. Runoff is medium. The shrink swell potential is very high.

About half of the acreage is cropland or tame pasture. This soil is suited to cultivated crops and to tame pasture and hay Examples of suitable pasture plants are alfalfa intermediate wheatgrass, and smooth bromegrass. The soil is subject to surface compaction if tiled when wet and cannot be easily filled when dry Measures that improve Lith, help to control erosion, and conserve moisture are the main management needs in cultivated areas. Examples are minimizing tiliage, leaving crop residue on the surface, and including grasses and legumes in the cropping system. Stripcropping and field windbreaks can help to control wind erosion. Contour farming, grassed waterways, and terraces help to control water erosion.

If this soil is used for range, compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tith.

This soil is suited to windbreaks and environmental plantings however it takes in water slowly and the clavely subsoil can restrict the penetration of plant roots Windbreaks can be established, but optimum growth is unlikely

The capability unit is ille-4, Clayey range site.

ReA—Ree loam, 0 to 3 percent alopes. This deep, well drained, very gently sloping soil is on tarraces and uplands. Areas are 15 to more than 100 acres in size and are irregular in shape. Slopes are smooth

Typically the surface layer is very dark grayish brown thable loam about 7 inches thick. The subsol is dark grayish brown and brown firm day loam about 13 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light brownish gray, loam, sandy loam, and tine sandy loam. It has accumulations of time throughout in places the soil is dark to a depth of more than 20 inches.

Included with this soil in mapping are small areas of Bon Lane and Cahe soils. These soils make up less than 25 percent of any one mapped area. Bon soils have dark colors that extend to a depth of more than 20 inches. They are on narrow flood plains. Lane soils contain more clay in the subsoil than the Ree soil. They are on low terraces. Oahe soils are 20 to 40 inches deep to graveily material. They are on slight uses.

Fertility is medium and the content of organic matter moderate in the Ree soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is slow. The shrink swell potential is moderate.

Most of the acreage is cropiand. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are affalfa, intermediate wheatgrass, and smooth bromegrass. Measures that

conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and minimizing tillage.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow we'll except for those that require an abundant supply of moisture.

The capability unit is IIc-2; Sifty range site.

ReB—Ree loam, 3 to 7 percent slopes. This deep, well drained gently sloping and undulating soil is on terraces and uplands. Areas are 10 to 100 acres in size and are irregular in shape. Slopes are slightly convex.

Typically the surface eyer is very dark grayish brown loam about 7 inches thick. The subscir is dark grayish brown and brown firm clay loam about 13 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light brownish gray loam, sandy loam, and fine sandy loam. It has accumulations of lime throughout. In places the soil is dark to a depth of more than 20 inches.

Included with this soil in mapping are small areas of Beadle. Delmont, Oahe, and Oko soils. These soils make upliess than 25 percent of any one mapped area. Beadle and Oko soils are sightly higher on the landscape than the Ree soil. Also, they have more clay in the subsoil. Delmont soils are 14 to 20 inches deep to gravelly material. They are on knotis. Oahe soils are 20 to 40 inches deep to gravelly material. They are in positions on the landscape similar to those of the Ree soil.

Fertity is medium and the content of organic matter moderate in the Ree soil. Tith is good. Available water capacity is high. Permeability is moderate. Runoft is medium. The shrink-swell potential is moderate.

No major hazards or limitations affect the use of this soi for range. Proper stocking rates and timely determent of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are affalia, infermediate wheatgrass, and smooth bromegrass. Measures that help to control erosion and conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface minimizing tillage, and including grasses and legumes in the cropping system. Contour farming, terraces, and grassed waterways help to control erosion.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture. Planting on the contour helps to control erosion.

The capability unit is lie-1; Silty range site.

Percent slopes. This moderately sleep and steep map unit occurs as areas where shale crops out and is intermingled with a shallow well drained Sansard soil it is on the breaks along the Missouri River at generally is dissected by namow drainageways and guilles. The Rock outcrop is on convex slopes. The Sansard soil is on side slopes, Landslides are common on the steeper slopes. Areas are 80 to several hundred acres in size and are knegular in shape. They are 40 to 50 percent Rock outcrop and 35 to 45 percent Sansard soil. The Rock outcrop and the Sansard soil occur as areas so closely intermingled or so small that mapping them separately is not practical.

The Rock outcrop is shale that has many manganese concretions throughout. It does not support vegetation.

Typically, the surface layer of the Sansarc soil is grayish brown clay about 4 inches thick. The underlying material is light brownish gray, light olive gray, calcareous clay and very shally clay. Light gray shall bedrock is at a depth of about 15 inches.

Included with the Rock outcrop and the Sansarc soil in mapping are small areas of Bullcreek and Opal soils. Bullcreek soils do not have shale within a depth of 40 inches. They are along drainageways. Opal soils are 20 to 40 inches deep over shale bedrock. They are on some of the lower side slopes.

Fertility and the content of organic malter are low in the Sansarc soli Available water capacity is very low Permeability is slow. Runoff is very rapid. The shrinkswell potential is very high.

The Rock outcrop does not support grazable vegetation. In all areas the Sansarc soil supports native grasses that are used for grazing. Water erosion is a hazard. Guilles form along some cattle trails. Reestablishing vegetation is difficult.

This map unit is too steep and too shallow for cultivated crops, tame pasture and hay and windbreaks and environmental plantings.

The Rock outcrop is in capability unit Vills-2 and is not assigned to a range site: the Sansarc soil is in capability unit Vile-8, Shallow Clay range site.

SeE—Sansarc-Opal claye, 12 to 20 percent slopes. These well drained, strongly sloping and moderately steep soils are on uplands. The shallow Sansarc soil is on the upper side slopes and ridges. The moderately deep Opal soil is on the lower side slopes and less convex parts of the landscape. Areas are 50 to several hundred acres in size and are irregular in shape. They are 40 to 50 percent Sansarc soil and 25 to 35 percent Opal soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practica.

Typically, the surface layer of the Sensarc soil is grayish brown clay about 4 inches thick. The underlying material is light brownish gray, calcareous clay and very shally clay. Light gray shalls bedrock is at a depth of about 15 inches.

Typically, the surface layer of the Opal soil is gray clay about 5 inches thick. The subsoil is grayish brown, very firm clay about 17 inches thick. It is calcarsous in the lower part. The underlying material is light brownish gray, mottled, calcareous clay it has accumulations of time throughout. Light gray shale bedrock is at a depth of about 37 inches. In some areas the depth to shale is more than 40 inches.

Included with these soils in mapping are small areas of Bullcreek and Chantier soils, Rock outcrop, and Sickspots. These inclusions make up less than 25 percent of any one mapped area. Bullcreek soils are more than 40 inches deep to shale. They are along drainageways. The shallow Chantier soils contain more salts than the Sansarc soils. They are on the lower side slopes. Rock outcrop and Slickspots do not support vegetation. Rock outcrop is on convex slopes. Slickspots are on the lower foot slopes.

Fertility is low in the Sansarc soil and medium in the Opal soil. The content of organic matter is low in the Sansarc soil and moderate in the Opal soil. Fifth its poor in both soils. Available water capacity is very low in the Sansarc soil and low in the Opal soil. Permeability is slow in the Sansarc soil and very slow in the Opal soil Runoff is rapid on both soils. The shrink-swell potential is very high.

Most of the acreage supports hative grasses and is used for grazing or hay. Water erosion is a hazard on these strongly sloping and moderately steep soils unless an adequate plant cover is maintained. Establishing vegetation is difficult in denuded areas. Sites for stock water impoundments are available in some of the draws, however, seepage could be a problem.

These soils generally are too steep for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The Sansarc soil is in capability unit Vie-12, Shallow Clay range site; the Opal soil is in capability unit Vie-4, Clayey range site.

SaF—Sansarc-Opat clays, 20 to 40 percent slopes. These well drained, moderately steep and steep soils are on the breaks along the Missouri River. The shallow Sansarc soil is on ndges and the steeper side slopes. The moderately deep Opal soil is on the lower side slopes. Slopes are mainly convex. Guilies are common. Some of the draws and north-facing slopes support stands of ceder trees. In places a few scattered glacial stones are on the surface. Areas are 100 to several hundred acres in size and are irregular in shape. They are 50 to 60 percent Sansarc soil and 15 to 25 percent Opal soil. The two soils occur as areas so closely.

intermingled or so small that mapping them separately is not practical

Typically, the surface layer of the Sansarc soil is grayeth brown clay about 4 inches thick. The underlying material is light brownish gray, calcareous clay and very shaly clay. Ught gray shale bedrock is at a depth of about 15 inches.

Typically, the surface layer of the Opal soil is gray clay about 5 inches thick. The subsoil is grayish brown, very firm clay about 17 inches thick. It is calcareous in the lower part. The underlying material is light brownish gray, motiled, calcareous clay. It has accumulations of lime throughout. Light gray shale bedrock is at a depth of about 37 inches.

Included with these soils in mapping are small areas of Bullcreek, Chantier, Gettys, and Sully soils, Rock outcrop, and Sickspots. These inclusions make up less than 25 percent of any one mapped area. Bullcreek soits are more than 40 inches deep to shale. They are along drainageways. The shallow Chantier soils contain more salts than the Sansarc soil. They are on the lower side slopes. Gettys and Sully soils are in positions on the landscape similar to those of the Sansarc soil. The deep, loamy Gettys soils formed in glacial till. The deep, silty Sully soils formed in losss. Rock outcrop and Sickspots do not support vegetation. Rock outcrop is on convex slopes. Sickspots are on the lower foot slopes.

Fertility is low in the Sansarc soil and medium in the Opal soil. The content of organic matter is low in the Sansarc soil and moderate in the Opal soil. Titth is poor in both soils. Available water capacity is very low in the Sansarc soil and low in the Opal soil. Permeability is slow in the Sansarc soil and very slow in the Opal soil. Hunoff is very rapid on both soils. The shrink-swell potential is very high.

Nearly all of the acreage supports native grasses and is used for grazing. Water erosion is a hazard on these moderately steep and steep soils unless an adequate plant cover is maintained. Establishing vegetation is difficult in denuded areas.

These soils generally are too steep for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The capability unit is Vile-8; the Sansarc soil is in Shallow Clay range site, the Opal soil in Clayey range site.

ScE—Schamber loam, 9 to 30 percent slopes. This excessively drained, strongly sloping to steep soil is on terrace scarps. It is very shallow to sandy and gravelly material. Areas are 15 to 200 acres in size and are irregular in shape. Slopes are short and convex.

Typically, the surface layer is dark grayish brown, calcareous loam about 3 inches thick. The underlying material to a depth of 60 inches is multicolored, calcareous gravelly loamy sand and gravelly sand, in

some places the surface layer is thicker in other places it is sandy loam.

Included with this soil in mapping are small areas of Lowry, Oahe, Opal, Orton, Ree, and Suily soils. These soils make up less than 25 percent of any one mapped area. Lowry and Sully soils are below the Schamber soil on the landscape. They are not underlain by gravelly materia. Oahe and Orton soils are on the less sloping side slopes. They are 20 to 40 inches deep over gravelly material. The clayey Opal soils are 20 to 40 inches deep over shall bedrock. They are on some of the lower side slopes. Ree soils are more than 40 inches deep over gravelly material. They are on the less sloping, smoother parts of the landscape.

Fertility and the content of organic matter are low in the Schamber soil. Available water capacity is very low Permeability is rapid. Runoff is slow

Most of the acreage supports native grasses and is used for grazing. Productivity is limited because the soil

is droughty. Reestabilishing vegetation is very difficult in denuded areas (fig. 7). Maintaining an adequate plant cover helps to prevent excessive erosion.

This soil generally is unsuited to cultivated crops, tame pasture and hay and windbreaks and environmental plantings because of the slope and the droughtiness. The soil is a probable source of sand and gravel.

The capability unit is VIs-4. Very Shallow range site

SdF—Sully silt loam, 25 to 40 percent slopes. This deep, well drained, steep soil is on uplands. Areas are 20 to 100 acres in size. They are long and narrow or are irregular in shape. Slopes are convex

Typically the surface layer is grayish brown sitt loam about 4 inches thick. The underlying material to a depth of 60 inches is brown and light yellowish brown, calcareous sitt loam, it has accumulations of lime throughout. In some places the depth to time is more



Figure 7.-An area of Schamber Idam, 9 to 30 percent slopes. Revegetating is very difficult.

than 5 inches. In other places shale bedrock or shally clay is at a depth of 20 to 60 inches.

Included with this soil in mapping are small areas of Sansarc and Schamber soils. These soils make up less than 10 percent of any one mapped area. The shallow clayey Sansarc soils are on steep side slopes below the Surly soil. Schamber soils are very shallow to gravel. They are on some ridges.

Fert lity and the content of organic matter are low in the Sully soil. Titlih is good. Available water capacity is high. Permeability is moderate. Runoff is rapid.

Most of the acreage supports native grasses and is used for grazing. Water erosion is a hazard unless an adequate plant cover is maintained. Reestablishing vegetation is difficult in denuded areas.

This soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of the slope.

The capability unit is V to 3. Thin Upland range arte.

SoC—Sulfy-Lowry silt loams, 5 to 9 percent slopes. These deep we'll drained imoderately sloping soils are on uplands. The Sulfy soil is on the upper convex slopes. The Lowry soil is on the lower and smoother slopes. Areas are 15 to 100 acres in size and are irregular in shape. They are about 50 to 70 percent Sulfy soil and 25 to 45 percent Lowry soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically the surface layer of the Sully soil is grayish brown sill loam about 4 nches thick. The underlying material to a depth of 60 inches is brown and light yellowish brown, calcareous silf loam. It has accumulations of time throughout.

Typically the surface layer of the Lowry soil is grayish brown sitt loam about 7 inches thick. The subsoil is grayish brown and brown, very fnable sill loam about 13 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale brown calcareous silt loam and loam. In places the soil is dark to a depth of more than 20 inches.

Included with these soils in mapping are small areas of the excessively drained Schamber soils on ridges and knotis. These included soils make up less than 10 percent of any one mapped area.

Fertility is fow in the Sully soil and medium in the Lowry soil. The content of organic matter is low in the Sully soil and moderate in the Lowry soil. Tilth is good in both soils. Available water capacity is high. Permeability is moderate. Runoff is medium.

About half of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay Examples of suitable pasture plants are alfalfa. Intermediate wheatgrass, and smooth bromegrass. The high content of time in the surface layer of the Sully soil adversely affects the availability of plant nutrients. Measures that help to control erosion and improve.

ferfitity are the main management needs in cultivated areas. Leaving crop residue on the surface and minimizing tillage are examples. Contour farming, terraces, and grassed waterways help to control erosion.

No major hazards or amitations affect the use of these soils for range however water erosion is a hazard if the range is overgrazed. Guillies form along some cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

These sois are suited to windbreaks and environmental plantings, but the high time content in the surface tayer of the Sully soil is a limitation. All climatically suited trees and shrubs grow well on the Lowry soil except for those that require an abundant supply of moisture. Trees and shrubs can be established on the Sully soil but optimum survivar, growth, and vigor are unlikely. Planting on the contour heips to control erosion.

The Sully sox is in capability unit IVe-3. Thin Upland range site the Lowry sox is in capability unit life 1, Si by range site.

SoE—Sully-Lowry slit loams, 9 to 25 percent slopes. These deep well drained strongly sloping and moderately steep soils are on uplands. The Sully soil is on the upper convex slopes. The Lowry soil is on the lower slopes. Slopes are mostly convex. Areas are 30 to more than 250 acres in size and are irregular in shaps. They are 55 to 75 percent Sully soil and 25 to 45 percent Lowry soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically the surface layer of the Sully soil is grayish brown sit loam about 4 inches thick. The underlying material to a depth of 60 inches is brown and light yellowish brown, calcareous sit loam. It has accumulations of time throughout. On some of the steeper side slopes, shale bedrock or shally clay is at a depth of 20 to 60 inches.

Typically the surface layer of the Lowry soil is grayish brown silt loam about 7 inches thick. The subsoil is grayish brown and brown, very fnable silt loam about 13 inches thick it is calcareous in the lower part. The underlying material to a depth of 60 inches is pale brown calcareous silt loam and loam. In places the underlying material contains more sand.

Included with these soils in mapping are small areas of Betts. Gettys. Orton, Sansarc, and Schamber soils. These included soils make upless than 25 percent of any one mapped area. Betts and Gettys soils formed in loamy glacial till. Orton and Schamber soils are underlained by graveily material. Sansarc soils are 4 to 20 inches deep over shale bedrock. Betts. Gettys, Sansarc, and Schamber soils are in positions on the landscape similar to those of the Sully soil. Orton soils are in the less sloping areas.

Fertility is low in the Sulfy soil and medium in the Lowry soil. The content of organic matter is low in the Sulfy soil and moderate in the Lowry soil. Available water capacity is high in both soils. Permeability is moderate Runoff is medium.

Most of the acreage supports native grasses and is used for grazing or hay. Water erosion is a hazard on these strongly sloping and moderately steep soils unless an adequate plant cover is maintained. Reestablishing vegetation is difficult in denuded areas.

These soils generally are unsuited to cultivated crops because of the slope. They are suited to tame pasture and hay, but the high content of time in the surface layer of the Sully soil is a limitation. The best suited pasture plants are affairs, intermediate wheatgrass, and smooth bromescass.

The Sully soil generally is unsuited to windbreaks and environmental plantings because of the slope. The Lowry soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well on the Lowry soil, except for those that require an abundant supply of moisture. Planting on the contour helps to control erosion.

The Sully soil is in capability unit Vie-3, Thin Upland range site; the Lowry soil is in capability unit IVe-3, Sity range site.

SaE—Suity-Schamber complex, 9 to 25 percent slopes. These strongly sloping and moderately sleep soils are on uplands. The deep, well drained Suity soil is on side slopes and the less convex ridges. The excessively drained Schamber soil is on ridges. It is very shallow to gravelly material. Areas are 10 to more than 200 acres in size and are irregular in shape. They are 60 to 70 percent Suity soil and 20 to 30 percent Schamber soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Sully soil is grayish brown silt loam about 4 inches thick. The underlying material to a depth of 60 inches is brown and light yellowish brown, calcareous silt loam. It has accumulations of lime throughout.

Typically, the surface layer of the Schamber soil is dark grayish brown, very friable, calcareous loarn about 3 inches thick. The underlying material to a depth of 60 inches is multicolored, calcareous gravelly loarny sand and gravelly sand. In some areas the surface layer is sandy loam.

Included with these soils in mapping are small areas of Betts, Gettys, and Sansarc soils. These included soils make up less than 20 percent of any one mapped area. Betts and Gettys soils are on some of the upper side slopes. They formed in glacial till. Sansarc soils are on some of the lower side slopes. They have shale bedrock at a depth of 4 to 20 inches.

Fertility and the content of organic matter are low in the Sully and Schamber soils. Available water capacity is high in the Sully soil and very low or low in the Schamber soil. Permeability is moderate in the Sully soil and rapid in the Schamber soil. Runoff is medium on both soils

Most of the acreage supports native grasses and is used for grazing. Water erosion is a hazard on these strongly sloping and moderately steep soils. Productivity is limited because the Schamber soil is droughty. Reestablishing vegetation is difficult in denuded areas.

These soils generally are unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of the alope. The droughtness of the Schamber soil also is a limitation. This soil is a probable source of sand and gravel.

The Sully soil is in capability unit Vie-3, Thin Upland range site; the Schamber soil is in capability unit Vis-4, Very Shallow range site

UsA:—Uly slit loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on uplands. Areas are 20 to more than 100 acres in size and are irregular in shape. Slopes generally are smooth.

Typically, the surface soil is grayish brown sill loam about 9 inches thick. The subsoil is brown and pale brown, friable sill loam about 14 inches thick. In the lower part it is calcareous and has accumulations of time that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and very pale brown, calcareous sitt loam. In some places the subsoil contains more clay in other places the soil contains less clay throughout.

Included with this soil in mapping are small areas of Mobridge and Plankinton soils. These soils make up less than 15 percent of any one mapped area. The moderately well drained Mobridge soils are in swales. The poorly drained Plankinton soils are in depressions.

Ferblity is medium and the content of organic matter moderate in the Uly soit. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is slow

Most of the acreage is cropland. Some areas are impated. This sold is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface, minimizing tillage, and including grasses and legumes in the cropping system.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely determent of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow

well except for those that require an abundant supply of moisture.

The capability unit is lic-2; Sity range site

UaB—Uly sit foam, 2 to 6 percent alopes. This deep, well drained, gently sloping soil is on uptands. Areas are 40 to more than 1,000 acres in size and are irregular in shape. Slopes are smooth or slightly convex.

Typically the surface son is grayish brown sill loam about 9 inches thick. The subson is brown and paid brown, friable sit loam about 14 inches thick. In the tower part it is calcareous and has accumulations of time that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and very pale brown, calcareous sitt loam. In some places the subsoit contains slightly more clay in other places the soil contains seek clay throughout.

Included with this soil in mapping and small areas of Java. Mobridge Plankinton, and Sully soils. These soils make upliess than 15 percent of any one mapped area. Java and Sully soils are on knotis. They are shallower to lime than the Uty soil. Also Java soils contain more sand in the subsoil, and Sully soils contain less clay throughout. The moderately well drained Mobridge soils are in swales. The poorly drained Plankinton soils are in depressions.

Fort ty is medium and the content of organic matter moderate in the Uly soil. Titth is good. Available water capacity is high. Permeability is moderate. Runoff is medium.

Most of the acreage is croptand. Some areas are irrigated. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are attain intermediate wheatgrass, and smooth bromegrass. Measures that help to control erosion and conserve moisture are the main management needs in cultivated areas. Examples are including grasses and legumes in the cropping system, leaving crop residue on the surface, and minimizing tirlage. Contour farming, grassed waterways, and terraces help to control erosion.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and limiting determent of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well except for those that require an abundant supply of moisture. Planting on the contour helps to control erosion.

The capability unit is lie-1; Sitty range sits

UaC.—Uly silt loam, 6 to 9 percent slopes. This deep, well drained, moderately sloping soil is on uplands. Areas are 20 to 200 acres in size and are irregular in shape. Slopes are smooth or slightly convex.

Typically the surface soil is grayish brown silt loam about 9 inches thick. The subsoil is brown and pale

brown friable sift loam about 14 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is paie brown and very pare brown, calcareous sift loam. In some places the subsoil contains more day in other places the soil contains less day throughout.

Included with this sor in mapping are small areas of Java Mobindge and Surly soils. These soils make upless than 15 percent of any one mapped area. Java and Sully soils are on knolls and ridges. They are shallower to time than the city soil. Also Java soils contain more sand in the subsoil and Sully soils contain less city throughout. The moderately well drained Mobindge soils are in swales.

Fertility is medium and the content of organic matter moderate in the Uly soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is medium.

About half of the acreage is cropland. Some areas are impaled. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromograss. Measures that help to control erosion are the main management needs in cultivated areas including grasses and regumes in the cropping system, leaving crop residue on the surface, and min mixing billage are examples. Contour farming terraces, and grassed waterways help to control erosion.

No major hazards or limitations affect the use of this soil for range however water erosion is a hazard if the range is overgrazed. Guities form along some cattle trails. Fencing and other means of controlling investock traffic patterns help to prevent guillying.

This soil is suited to windbreaks and environmental plantings. All chimatically suited trees and shrubs grow well except for those that require an abundant supply of moisture. Planting on the contour helps to control erosion.

The capability unit is ille-1; Silty range site.

Wd—Wendte silty clay. This deep moderately well drained nearly level soil is on flood plains. It is subject to rare flooding. Areas are 10 to 100 acres in size and generally are long and narrow.

Typically the surface soil is grayish brown calcareous sifty clay about 5 inches thick. The underlying material to a depth of 60 inches is grayish brown and light brownish gray stratified calcareous sifty clay loam and clay loam.

included with this soil in mapping are small areas of Bullcreek and Promise soils. These soils make upless than 20 percent of any one mapped area. They are on uplands and loot slopes near the flood plains. They are not stratified.

Fertility is medium and the content of organic matter moderate in the Wendte soil. Tith is poor Available water capacity is moderate or high. Permeability is slow. Bunoff also is slow. The shrink swell potential is high.

More than half of the acreage supports netive grasses and is used for grazing or hay. Compaction is a problem Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth. Although the soil is subject to brief periods of flooding, the additional moisture is beneficial.

This soil is suried to cultivated crops. Measures that improve tilth and help to control wind erosion are the main management needs. Leaving crop residue on the surface and including grasses and legumes in the cropping system are examples. Chiseting or subsoiling improves tilth and increases the rate of water intake for a short time.

This soil is suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, green needlegrass, intermediate wheatgrass, smooth bromegrass, and western wheatgrass. The surface soil becomes compacted and the grass stands deteriorate if the pasture is grazed when well Deferred grazing during wet periods helps to prevent surface compaction.

This sow is suited to windbreaks and environmental plantings, but it takes in water slowly and the crayey underlying material can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely

The capability unit is ills-3, Overflow range site

We—Wendte slity clay, channeled. This deep moderately well dramed, nearly level soil is on flood plains that are dissected into many small tracts by narrow channels, it is occasionally flooded. Areas are 20 to several hundred acres in size and are long and narrow.

Typically the surface soil is grayish brown, calcareous silty clay about 5 inches thick. The underlying material to a depth of 60 inches a grayish brown and light brownish gray, stratified, calcareous silty clay loam and clay loam.

Included with this soil in mapping are small areas of Bon Buildreek Delmont. Oahe Promise and Ree soils. These soils make up less than 25 percent of any one mapped area. Bon soils contain less day throughout than the Wendle soil. They are in positions on the landscape similar to those of the Wendle soil. Buildreek and Promise soils are on uplands and foot slopes near the flood plains. They are not stratified. Delmont, Oahe, and Ree soils are on terraces. Delmont soils are 14 to 20 inches deep over gravelly material. Oahe soils are 20 to 40 inches deep over gravelly material. The loamy Ree soils are well drained.

Fertility is medium and the content of organic matter moderate in the Wendte soil. Tilth is poor. Available water capacity is moderate or high. Permeablity is slow. Runoff also is slow. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for grazing. Compaction is a problem. Restricted

grazing during wet periods helps to prevent surface compaction and detengration of titth. Although the soil is occasionally flooded, the additional water is beneficial Pools of water in some areas of the channels provide temporary watering places for livestock and wildlife Native trees and shrubs provide excellent habitat for wildlife and winter protection for livestock.

This soil generally is unsuited to cultivated crops because of the meandering channels and the flooding in areas that are accessible to farm machinery. Lis suited to tame pasture and hay Atlaifa green needlegrass, intermediate wheatgrass smooth bromegrass, and western wheatgrass are examples of suitable pasture plants. Debris deposited by floodwater in some years damages pasture plants and hinders having

This so, is suited to windbreaks and environmental plantings, but it takes in water slowly and the clavey underlying material can restrict the penetration of plant roots. Because of the meandering stream channels, trees and shrubs generally cannot be planted by machine.

The capability unit is Viw-1; Overflow range site.

Wo—Worthing sitty clay loam. This deep, very poorly drained, level soil is in depressions on uplands. It is pended during periods of snowmelt or heavy rainfall. Areas are 10 to several hundred acres in size and are irregular in shape.

Typically, the surface layer is dark gray sitly clay toam about 5 inches thick. The subsoil is dark gray and gray very firm sitly clay about 41 inches thick. In the lower part it is calcareous and has a few accumulations of time. The underlying material to a depth of 60 inches is gray, calcareous sitly clay. It has accumulations of time throughout in places the socies not so poorly drained.

Fertility and the content of organic matter are high Tilth is poor. Available water capacity is moderate or high. A seasonal high water table is within a depth of 1 foot. As much as 1 foot of water ponds on the surface turing some wet periods. Permeability is slow. Runoff is ponded. The shrink swell potential is high.

Most of the acreage supports native grasses and is used for grazing. Compaction and ponding are problems. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of 18th. Many areas are potential sites for excavaled ponds.

This soil is suited to tame pasture and hay, but the choice of plants is limited to reed caracygrass, Garrison creeping foxtail and similar species. The soil generality is unsuited to cultivated crops and to windbreaks and environmental plantings because of the ponding. It is an excellent breeding site for waterfowl in the spring

The capability unit is Vw-4; Shallow Marsh range site.

Wp--Worthing slity clay loam, ponded. This deep, very poorly drained, level soit is in depressions on

uplands. It is ponded most of the year. Areas are 15 to several thousand acres in size and are oval.

Typically, the surface layer is dark gray silty clay loam about 5 inches thick. The subsoil is dark gray and gray very firm silty clay about 41 inches thick. In the lower part it is calcareous and has a few accumulations of time. The underlying material to a depth of 60 inches is gray, calcareous silty clay. It has accumulations of lime throughout.

Fertility and the content of organic matter are high. Tith is poor Available water capacity is moderate or high. A seasonal high water table is within a depth of 0.5 foot. As much as 3.0 feet of water ponds on the surface during some wet periods. Permeability is slow. Runoff is pended. The shrink-swell potential is high.

Most areas support native vegetation and are used as wetland wildlife habitat (fig. 8). The native vegetation is a luxuriant stand of bulrushes, reedgrass, sedges, and

cattalls. Some areas are potential sites for excavated ponds

This soil generally is unsuited to cultivated crops, tame pasture and hay and windbreaks and environmental plantings because of the ponding

The capability unit is VIIIw-1, no range site is assigned

### Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short-and long-range needs for food and fiber. Because the supply of high quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.



Figure 8.—An area of Worthing silty clay loam, ponded. Most areas of this soil are used as habitat for wildlife.

Prime farmland, as defined by the U.S. Department of Agriculture is the land that is best suited to food feed. forage fiber and oilseed crops, it may be cultivated land, pasture, woodland or other land, but it is not urban. and built up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil economically to produce a sustained high yield of crops. Prime farmland produces. the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment

Pome farmland has an adequate and dependable supply of moisture from precipitation or imgation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for iong periods and is not frequently flooded during the growing. season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service

About 33,210 acres in Brule and Buffalo Counties, or about 4 percent of the total land area, meets the soil requirements for prime farmland. This includes about 8,000 acres of impated land. About 299,785 additional

acres would meet the requirements for prime farmland if impated or drained. The main crops grown on this land ere com, sorghum, oats, alfalfa, and wheat.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of onme termined to other uses puts pressure on marginal lands, which generally are more erodible droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use The extent of each ested map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Soils that have imitations, such as a seasonal high water table, frequent flooding during the growing season, or inadequate raintals qualify for prime farmland only inareas where these limitations have been overcome by such measures as drainage flood control or impation. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these smitations have been overcome by corrective measures.

# Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid somrelated takures in land uses

In preparing a soil survey, soil scientists. conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics. of the soils. They collect data on erosion, droughtiness. flooding, and other lactors that affect various soil uses. and management. Field expenence and collected data on soil properties and performance are used as a basis in predicting soil behavior

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland: as sites for buildings, sanitary facilities. highways and other transportation systems, and parks. and other recreation facilities, and for wriding habital, it can be used to identify the potentials and iimitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil

properties

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil

layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate siles for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

## Crops and Pasture

Eugene Waterson, district conservationist, Soil Conservation Service. helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability class/scation used by the Soil Conservation Service is explained; and the estimated

yields of the main crops and hay and pasture plants are listed for each soil

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under. Detailed Soil Map Units. Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 51 percent of the acreage in Brule County and 22 percent of that in Buffelo County are used for cultivated crops or for tame pasture and hay (3). The major crops are alfalfa corn dats grain sorghum and wheat Barrey sunflowers, and soybeans also are grown Corn is grown for grain and sliage loats sorghum, and wheat for grain, and alfalfa mainly for hay. Alfalfa intermediate wheatgrass, and smooth bromegrass are grown for tame pasture. Attalla seed also is harvested as a cash crop.

The potential of the soils in the survey area for increased crop production is good. About 146 000 acres of potentially good cropland is currently used as range and 11,000 acres as pasture (12). Food production could also be increased considerably by extending the latest crop production technology to all cropland in the county This soil survey can greatly facilitate the application of such technology. The paragraphs that to low describe the management needed on the cropland in the survey

Water erosion reduces productivity and results in sedimentation in streams and takes. Productivity is reduced when the more fertile surface tayer is lost and part of the subsoil is incorporated into a plow layer. Loss of the surface layer is especially damaging on soils that have a thin surface layer such as Betts and Sully soils. Erosion also reduces the productivity of soils that tend to be droughty such as Oahe and Opal sous. When erosion occurs, sed ment rich in nutrients enters the streams and lakes. Measures that control erosion. minimize the poliution of streams and takes by sediment and preserve water qualty for fish and wildlife recreation, and municipal use. They also reduce the amount of fertilizer needed in cropped areas and prevent the removal of plant nutrients

A cropping system that keeps a plant cover on the surface for extended periods holds soil losses to an amount that does not reduce the productive capacity of the soils. If a plant cover cannot protect the soil, careful management of crop residue is essential. Minimizing tiliage and leaving crop residue on the surface increase the water infiltration rate, reduce the runoff rate, and help to control erosion.

Terraces and diversions reduce the length of slopes and the runoff rate and help to control erosion. They are most practical on deep, well drained soils that have long, smooth slopes. Some soils, such as Beadle and Highmore, are poorly suited to terraces and diversions because of short, irregular slopes.

Wind erosion is a slight to severe hazard on many of the soils in the survey area. The hazard is especially severe on Betts and Sully soils. Wind erosion can damage these soils in a few hours if winds are strong and the soils are dry and are not protected by a plant cover or surface mulch. An adequate plant cover, a cover of crop residue, and a rough surface help to control wind erosion. Windbreaks of suitable trees and shrubs also are effective

Information about the measures that control erosion on each kind of soil is contained in the Technical Guide, available in the local office of the Soil Conservation Service.

Soil fertility helps to determine the yields that can be obtained from the soil. It can be improved by applying fertilizer and by including grasses and legumes in the cropping system. The kinds and amounts of fertilizer needed on Java and other soils that have a high content of lime in the surface layer generally differ from the kinds and amounts needed on soils that do not have lime in the surface layer. On all soils, additions of fertilizer should be based on the results of soil tests, on the need of the crop, and on the expected yield level. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer needed.

Soil tith is an important factor in the germination of seeds and the infiltration of water into the soil. Soils with good tilth are granular and porous. In Miliboro, Promise, and Wendte soils, tilth is poor. These soils dry out slowly in the spring and cannot be easily tilled when dry. If they are farmed when wet, they tend to be cloddy when dry. As a result of the cloddiness, preparing a seedbed is difficult. Timely tillage, inclusion of grasses and legumes in the cropping system, and incorporation of crop residue into the soil improve tilth and increase the rate of water chake.

Field crops suited to the sorts and climate of the survey area include close-grown crops and row crops. Oats and wheat are the main close-grown crops. Corn and sorghum are the main row crops.

The deep, well drained or moderately well drained soils are suited to all of the crops commonly grown in the survey area. Examples are Bon, Glenham, Highmore, Mobridge, and Uly soils. Oake and other droughty soils are better suited to early meturing small grain than to the deeper rooted crops, such as com and alfalfa, because the porous underlying material limits the depth to which

roots can penetrate and the available water capacity. Sufly and other soils that are susceptible to wind erosion are better suited to close-grown crops than to other crops.

Many of the deep, well drained sods are suited to impation. Examples are Highmore, Lowry, Ree, and Uly soils. The main concerns of management are conserving moisture and improving fertility and tilth in all impated soils and controlling erosion on sods that have a slope of more than 2 percent. The quakty of the impation water is a concern if water from a well is used. The best water has a low content of saits and sodium.

Pasture plants best suited to the climate and most of the soils in the survey area include alfalfs, intermediate wheatgrass, and smooth bromegrass. Because of the hazard of erosion bunchgrasses, such as crested wheatgrass, should not be planted in areas where the slope is more than 6 percent. On the poorly drained Koffs and Plankinton soils, the choice of pasture plants is limited to water-tolerant species, such as Garrison creeping foxtail and reed canarygrass.

If the pasture is overgrazed, the grasses lose vigor and die and usually are replaced by annual grasses and weeds. Proper stocking rates, timely determent of grazing, and applications of fertilizer help to keep the pasture in good condition.

#### Yields Per Acre

The average yields per scre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in table 6.

The yields are based mainly on the experience and records of larmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates, suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects, favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barryard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

#### Land Capability Classification

Land capability classification shows in a general way the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their imitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criterial used in grouping the soils do not include major and generally expensive landforming that would change slope depth or other characteristics of the soils nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and imitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system soils are generally grouped at three levels capability class subclass and unit (10). These levels are defined in the following paragraphs.

Capability classes the broadest groups are designated by Roman numerals I through VI. The numerals indicate progressively greater imitations and narrower choices for practical use. The classes are defined as follows.

Class soils have few limitations that restrict their use Class it soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations impractical to remove that simil their use

Class VI socs have severe limitations that make them generally unsuitable for curbivation.

Class VII soils have very severe limitations that make them unsultable for cultivation

Class VII soils and miscellaneous areas have kmitations that nearly preclude their use for commercial crop production

Capability subclasses are soil groups within one class. They are designated by adding a small letter e w.s. or c. to the class numeral for example e. The letter e shows that the main limitation is risk of erosion unless close-growing plant cover is maintained, wishows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly

corrected by artificial drainage), a shows that the soil is kindled mainly because it is shallow droughty or stony and clusted in only some parts of the United States shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by w. s. or c because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, range and, woodland, wildlide habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, i.e. 1 or file-4. The capability units are not numbered consecutively because not all of the units in the statewide system are represented in the county.

The capability classification of each map unit is given in the section. Detailed Soil Map Units, and in table 6.

### Rangeland

Arnold G. Mendenhall resource conservationst, Soil Conservation Service prepared this section.

Rangeland supports native vegetation suitable for grazing or browsing. It includes and revegetated to native plants. The vegetation consists mainly of grasses, grassiske plants, forbs or shrubs. The amounts and kinds of native vegetation grown in any one area are determined by the soil topography, climate, past use, and management.

All of the survey area was rangeland before the first permanent settlers arrived. Today, approximately 75. percent of Buffalo County and 44 percent of Brule County support native vegetation. This rangeland supplies a major portion of the forage for livestock in the area. Approximately 70 percent of the farm and ranch. income in the survey area is derived from the sale of livestock. Most of the ranches are cow-call operations. Some are yearling operations, however, some ranchers, combine their cow herds with yearlings. This practice permits greater flexibility in adjusting livestock numbers. during periods of drought. The rangeland generally is grazed from May through October. The forage provided by rangeland generally is supplemented by crop aftermath and tame pasture plants, such as crested wheatgrass and smooth bromegrass. In winter it is supplemented by protein concentrate and hav-

Brule and Buffalo Counties are part of the mixed grass prairie (8). The native vegetation is dominated by mid grasses and forbs, but tall and short grasses and forbs are also mixed in with these plants. The mixed grass prairie consists of cool, and warm-season plants, which provide good quality forage throughout the growing.

season. The cool-season plants grow mostly during April. May, and June and the warm-season plants during June July, and August. The cool-season grasses may start growing again in September and October if fall rains are adequate.

The native vegetation in some parts of the survey area is producing below its potential because of past misuse. The tail grasses and some mid grasses have been reduced in abundance and have been replaced by less desirable plants. In many areas the tall and mid warm-season grasses have been replaced by cool-season grasses because of continual overuse during the prime growing season of the warm-season plants. An imbalance of cool-season grasses to warm-season grasses is the result. In most areas, however, amough of the original plants remain for good grazing management to reestablish the high quality plants.

#### Range Sites and Condition Classes

Different kinds of soil vary in their capacity to produce native vegetation. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, sait. content, and a seasonal high water table are also important. Soils that produce approximately the same kinds amounts, and proportions of native vegetation. make up a range site. The potential native vegetation on a range site is the stabilized plant community that the site is capable of producing. It consists of the plants that were growing when the region was settled. This plant community maintains itself and changes very little as long as the environment remains unchanged. The relationship between soils and vegetation was ascertained during this survey, thus, range sites generally can be determined directly from the soil map

The plants within the native plant community are sometimes grouped or classed as decreasers. increasers, or invaders based on their response to grazing pressure Decreasers are plants that respond to overgrazing by decreasing in abundance. They generally are the most productive plants and the ones most preferred by the grazing animals. Increasers are plants that respond to grazing pressure at least initially by increasing in amount as the more desirable decreaser plants become less abundant. Increasers generally are less productive and less preferred by grazing animals Invaders are plants that are not part of the original plant. community but invade the plant community because of some kind of disturbance or continued overgrazing. Some invader plants have little value for grazing. Because plants do not respond in the same manner to different influences, a plant may be a decreaser on some range sites but an increaser on others. A cool season. plant, for example, may be a decreaser if the site is grazed only during the spring but would be an increaser if the same site were grazed only during the summer The reverse would be true for the more preferred warmseason plants. Grazing only in spring would cause the warm-season plants to increase in abundance, and summer grazing would cause the warm-season plants to decrease.

Table 7 shows for nearly all the sors, the range site and the potential annual production of vegetation in lavorable average and unlavorable years. Potential annual production is the amount of vegetation that can be expected to grow annually on wer managed rangeland that is supporting the potential natural plant community. It includes an vegetation, whether or not it is palatable to grazing animals it includes the current year's growth of leaves twigs and fruits of woody plants it does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable average, and untavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average in an unfavorable year growing conditions are we'll below average generally because of low available so: **MOISTURE** 

Yields are adjusted to a common percent of air dry moisture content. The relationship of green weight to air dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Hange management maintains the capacity of the tange to produce forage for livestock and game animals and to provide wildlife habital water and watershed protection. The primary objective of good range management is to maintain the rangeland in excellent or good condition. The main management concern is responding to important changes in the plant community of a range site.

Plange condition is determined by comparing the present vegetation on a range site with the potential native plant community for that site. Four range condition classes are recognized. The range site is in excellent condition if 76 to 100 percent of the present vegetation is the same kind as the potential native vegetation in good condition if the percentage is 51 to 75 in fair condition if the percentage is 26 to 50, and in poor condition if the percentage is 25 or less. The productivity of rangeland depends on the range site, the range condition, and the moisture available to plants during the growing season.

Range management that maintains or improves the range condition is needed on all rangeland in the survey area. Proper stocking rates and rotation grazing or deterred grazing programs, which allow for the proper sequence of grazing and provide rest periods, maintain or improve the vigor of the key plants. Proper range management also includes range seeding, lending, and measures that provide water for livestock. Confour furrowing, pitting, deep chiseling, and other kinds of mechanical treatment are needed on some range sites.

There are 17 range sites in the survey area. They are Clayey. Claypan. Closed Depression. Dense Clay. Overlow. Saline Lowland. Sandy. Shallow. And Wetland. At the end of each map unit description, the soils are assigned to an appropriate range site. The paragraphs that follow describe the range sites in the survey area.

Clayey range site. The potential native vegetation on this site is mid and short prairie grasses interspersed with a variety of forbs. Green needlegrass and western wheatgrass which are cool-season grasses, make up about 65 percent of the vegetation. Warm-season grasses make up 30 percent as follows, sideoals grama, little bluestern, and big bluestern—20 percent, blue grama and buffalograss—10 percent. Forbs, such as heath aster, prairie coneflower, yarrow, sageworts, false boneset, and scartet globernallow, make up about 5 percent.

The major management concern on this site is maintaining the most productive grasses. Green needlegrass sideoats grama, little bluestern and big bluestern rapidity lose their productive capacity after continued overgrazing because the livestock prefer these plants. The amount of western wheatgrass initially increases after overuse. It decreases however if overuse continues. After continued overgrazing, the amount of blue grama and buffalograss increases and that of the taller grasses decreases. A tess productive short-grass site is the result. The most productive grasses can be maintained by using the proper stocking rates along with a rotation grazing or deferred grazing program, which provides rest periods during the key growing seasons of these plants.

Claypan range site. The potential native vegetation on this site is mid and short praine grasses interspersed with some forbs. Cool-season grasses make up about 65 percent of the vegetation, as follows western whealgrass—45 percent, green needlegrass—15 percent, and needleandthread—5 percent. Blue grama, buffalograss, and sideoats grama, which are warmseason grasses, make up about 25 percent of the vegetation. Blue grama is the dominant warm-season grass. Sedges, which are grasslike plants, and forbs make up the other 10 percent.

The major management concern on this site is maintaining the most productive grasses. The amount of green needlegrass western wheatgrass, needleandthread, and sideoats grama rapidly decreases after continuous overgrazing because the investock prefer these plants. The amount of blue grama and buffalograss increases as that of the other grasses decreases. Less forage production is the result. The most productive grasses can be maintained by using the proper stocking rates along with a rotation grazing or

deferred grazing program, which provides rest periods during the key growing seasons of these plants.

Closed Depression range site. The potential native vegetation on this site is dominantly western wheatgrass, 85 percent, and sedges, 10 percent. The plant community is not stable, however, because of alternating wet, and dry periods. The site, which is on the flat or concave bottoms of closed depressions, is excessively wet or periode during well periods and is droughtly during abnormally dry periods.

The major management concern on this site is maintaining the most desirable plant community. Continued overgrazing reduces the amount of western wheatgrass, and trampling by livestock aggravates the poor drainage of the site. After overgrazing, the amount of short grasses, such as saltgrass and Kentucky bluegrass, increases and that of western wheatgrass decreases. A less productive site is the result. The most productive grasses can be maintained by using the proper stocking rates along with timely deferment of grazing, which provides rest periods during the growing seasons of the desired plants and when the site is wet.

Dense Clay range site. The potential native vegetation on this site is mid prairie grasses interspersed with forbs. Western wheatgrass and green needlegrass, which are cool-season grasses, make up about 90 percent of the vegetation. Forbs, such as wild onion, make up about 10 percent. This site does not have an understory of short grasses.

The major management concern on this site is maintaining the productivity of the green needlegrass and western wheatgrass. After continued overgrazing these two grasses thin out and are replaced by invaders or the soil is bare and highly susceptible to erosion. The green needlegrass and western wheatgrass can be maintained by using the proper stocking rates along with a deferred grazing or rotation grazing program, which provides rest periods during the key growing seasons of these grasses.

Overflow range site. The potential native vegetation on this site is mixed prairie grasses. Big bluestem a tall warm-season grass, makes up about 55 percent of the vegetation. Other warm-season, tall and mid grasses, such as switchgrass, indiangrass. If the bluestem, and sideoats grama, make up 20 percent. Green needlegrass and western wheatgrass, which are coor season grasses, make up 20 percent, and readplant and sedges make up about 5 percent.

The major management concern on this site is maintaining the most productive grasses. Big bluestem, switchgrass, green needlegrass, indiangrass, and tille bluestem rapidly lose their productive capacity and thin out after continuous grazing because the livestock prefer these plants. As the amount of these plants decreases,

the amount of western wheatgrass and sideoats grama initially increases. After continuous overgrazing, however Kentucky bluegrass, a short cool season grass, increases in abundance and becomes the principal plant on the site. Low forage production is the result. The most productive grasses can be improved or maintained by using the proper stocking rates along with a deferred grazing or rotation grazing program, which provides rest periods during the key growing seasons of the desired plants.

Saline Lowland range site. The potential native vegetation on this site is salt tolerant plants. Prame cordgrass, western wheatgrass and Nuttail aika igrass make up about 70 percent of the vegetation. Alkali sacaton and switchgrass make up about 10 percent Inland saltgrass, sedges, and forbs make up about 20 percent.

The major management concern on this site is maintaining the most productive plants. After continuous overgrazing, the most preferred and productive grasses lose vigor and thin out. Inland satigrass is then able to increase in abundance and soon becomes the principal grass on the site. Because mand satigrass is unpalatable and productivity is low, this site loses its capacity to produce quality forage for livestock. The most productive grasses can be maintained by using the proper stocking rates along with a rotation grazing or deferred grazing program, which provides rest periods during the key growing seasons of these plants.

Sandy range site. The potential native vegetation on this site is mixed prairie grasses. Little bluestem sand bluestem and prairie sandreed, which are warm-season grasses, make up about 60 percent of the vegetation. Needleandthread and western wheatgrass, which are cool season grasses, make up about 20 percent. Sideoats grama and blue grama make up about 10 percent. Forbs such as heath aster scuripea, and sadewort, make up about 10 percent.

The major management concern on this site is maintaining the most productive grasses. The amount of sand bluestern and little bluestern decreases after continuous grazing because the investock prefer these plants. The amount of prairie sandreed, needleandthread, and sideoets grams initially increases as that of the other grasses decreases. After continuous overgrazing, these grasses thin out and are replaced by blue grams and Kentucky bisegrass. Low forage production is the result. The most productive grasses can be improved or maintained by using the proper stocking rates along with a deferred grazing or rotation grazing program, which provides rest periods during the key growing seasons of these plants.

Shallow range elts. The potential native vegetation on this site is dominantly warm-season praine grasses.

These grasses make up about 80 percent of the vegetation, as follows. Ittle bluestem—40 percent: sideoata grama—25 percent big bluestem—10 percent, and blue and hairy grama—5 percent Coor-season grasses, such as needleandthread and western wheatgrass, make up about 10 percent of the vegetation. Other plants, such as sedges, forbs, and shrubs, make up about 10 percent.

The major management concern on this site is maintaining the most productive grasses. Little bluestem and big bluestem rapidly lose their productive capacity after continuous grazing because the irvestock prefer these plants. The amount of needleandthread and sideoats grama initially increases after continuous grazing. It decreases however after continuous overgrazing. As the amount of these grasses decreases, blue and hairy grama increase in abundance. Low forage production is the result. The most productive grasses can be maintained by using the proper stocking rates along with a deferred grazing or rotation grazing program, which provides rest periods during the key growing seasons of these plants.

Shallow Clay range site. The potential native vegetation on this site is mirred prairie grasses. Warmseason grasses make up about 55 percent of the vegetation as follows liftle bluestem—30 percent, adeoats grama—10 percent, big bluestem—10 percent, and blue grama—5 percent. Western wheatgrass and green needlegrass, which are cool-season grasses make up about 35 percent of the vegetation. Sedges and forbs make up the other 10 percent.

The major management concern on this site is maintaining the most productive grasses. Little bluestem big bluestem, and green needlegrass rapidly lose their productive capacity after continuous grazing because the livestock prefer these plants. The amount of western wheatgrass and sideoats grama initially increases after continuous grazing. It decreases, however after continuous overgrazing. As a result, the amount of blue grams and other less productive forage plants increases. The most productive plants can be maintained by using proper stocking rates along with a deferred grazing or rotation grazing program, which provides rest periods during the key growing seasons of these plants.

Shallow Marsh range site. This site is ponded in spring and early in summer. The potential native vegetation on this site is water-toierant, tall prairie grasses and sedges. Rivergrass and slough sedge make up about 70 percent of the vegetation. American mannagrass, common spikesedge, prairie cordgrass, and reedgrass make up about 20 percent. Forbs, such as smartweed and waterplantain, make up about 10 percent.

The major management concern on this site is maintaining the most productive plants. After continued overgrazing invergrass and slough sedge decrease in abundance and are replaced by spikesedge and other grasslike plants. An increase in the abundance of less palatable vegetation results in a loss of usable torage. The most productive plants can be maintained by using the proper stocking rates along with a deferred grazing program, which provides rest periods during the key growing seasons of these plants.

Shallow to Gravel range site. The potential native vegetation on this site is mid prairie grasses. Coolseason grasses make up about 50 percent of the vegetation, as follows needleandthread. 40 percent, and western wheatgrass, 10 percent. Warm season grasses make up about 40 percent, as follows: little bluestern, plains multiplied site of the present and prairie dropseed—20 percent, and blue grama and harry grama—20 percent. Sedges, forbs, and shrubs make up about 10 percent.

The major management concern on this site is maintaining the most productive grasses. Needleandthread, western wheatgrass, little bluestem, plains muhly, sideoats grama, and prairie dropseed rapidly thin out after continuous overgrazing. When the amount of these grasses decreases, the amount of sedges blue grama, and hairy grama increases. If overgrazing continues, bare spots are interspersed with the grasses and the productivity of the site is greatly reduced. The most productive grasses can be maintained by using the proper stocking rates along with a rotation grazing or deferred grazing program, which provides rest periods during the key growing seasons of these plants.

Slity range site. The potential native vegetation on this site is mixed praine grasses. Cool season grasses make up about 55 percent of the vegetation. They are dominantly green needlegrass and western wheatgrass and lesser amounts of needleandthread and porcupinegrass. Warm-season grasses, such as little bluestern, big bluestern, praine dropseed, sideoats grama, and blue grama, make up about 35 percent of the vegetation. Forbs, such as the sageworts, health aster false boneset and shrubs, such as readplant, rose, and western snowberry, make up about 10 percent.

The major management concern on this site is maintaining the most productive grasses. After continuous grazing, the amount of bluestems praine dropseed porcupinegrass, and green needlegrass decreases because the twestock prefer these plants. The amount of western wheatgrass and needleandthread initially increases after continuous grazing. After continuous overgrazing however, short grasses, such as blue grama and Kentucky bluegrass, become the dominant blants. Low forage production is the result. The most productive grasses can be improved or maintained by using the proper stocking rates along with a deferred grazing or rotation grazing program.

which provides rest periods during the key growing seasons of the desired plants.

Subirrigated range site. The potential native vegetation on this site is dominantly tall warm season grasses. Big bluestem the dominant warm-season grass, makes up about 60 percent of the vegetation. Switchgrass indiangrass and little bluestem make up about 20 percent. Western wheatgrass, sedges, and bluegrasses make up about 10 percent. Forbs, such as Maximilian sunflower, showy mixiweed, and Missouri golderrood, make up about 10 percent.

The major management concern on this site is maintaining the most productive tail grasses. After continuous grazing the amount of big bluestem indiangrass and switchgrass decreases and that of western wheatgrass sedges, and Kentucky bluegrass increases. After continuous overgrazing. Kentucky bluegrass inland sattgrass, annual grasses, and weeds occupy the site. Very low forage production is the result. The most productive tall grasses can be maintained by using the proper stocking rates along with a rotation grazing or deferred grazing program, which provides rest periods during the key growing seasons of these plants.

Thin Claypan range site. The potential native vegetation on this site is a mixture of mid and short grasses. Western wheatgrass is the dominant coolseason grass it makes up about 40 percent of the vegetation. Short, warm-season grasses, such as blue grama and buffalograss, make up about 40 percent in and satigrass and sedges make up about 10 percent, and forbs, such as sagewort, heath aster, and brome snakeweed, make up about 10 percent.

The major management concern on this site is maintaining the western wheatgrase. After continued overgrazing this grass thins out and is replaced by blue grame, buffalograse, pricklypeer, and saltgrase. If overgrazing continues, large bare areas are interspersed with the grasses especially during dry periods and weeds are common during wet periods. The western wheatgrass can be improved or maintained by using the proper stocking rates along with a deferred grazing program, which provides rest periods during the key growing seasons of the desired prants.

Thin Upland range site. The potential native vegetation on this site is mixed prairie grasses. Warmseason grasses make up 70 percent of the vegetation as follows: little bluestem -40 percent, sideoals grama, big bluestem, and plains multiy-20 percent, and bild grama—10 percent. Cool season grasses, such as green needlegrass, western whealgrass, and needleandthread, make up about 20 percent of the vegetation. Forbs, such as pasqueflower and blacksamson, and woody plants, such as leadplant and rose, make up about 10 percent.

The major management concern on this site is maintaining the most productive grasses. Little bluestem, big bluestem, green needlegrass, and plains multipliose their productive capacity and thin out after continuous grazing because the Irvestock prefer these plants. The amount of western wheatgrass, sideoats grama, and needleandthread antially increases as the other grasses thin out. After continuous overgrazing, short grasses, such as blue grama, dominate the site Low forage production is the result. The most productive grasses can be improved or maintained by using the proper stocking rates along with a deferred grazing or rotation grazing program, which provides rest periods during the key growing seasons of the desired plants.

Very Shallow range site. The potential native vegetation on this site is mid and short grasses. Needleandthread, the dominant mid grass, makes up about 30 percent of the vegetation. Short grasses, such as blue grams and herry grams, make up about 30 percent. Sedges, such as threadleaf sedge, make up about 20 percent. Forbs, such as dotted gayleather, blacksamson, and sagewort, and shrubs, such as readplant and small soapweed, make up about 20 percent.

The main management concern on this site is maintaining a good stand of grass. After overgrazing, the site rapidly deteriorates to a stand of grams grasses, threadlest sedge, and a few unpalatable forbs. If overgrazing continues, the stand of short grasses may thin out and much of the site is bare and subject to erosion. A productive grass cover can be maintained on the site by using the proper stocking rates along with a deferred grazing or rotation grazing program, which provides rest periods during the key growing seasons of the desired plants.

Wetland range site. The potential native vegetation on this site is grasses and sedges that can tolerate welness. A high water table rises above the surface for short periods during spring. Praine cordgrass makes up about 60 percent of the vegetation. Western wheatgrass makes up about 20 percent. Nultail alkaligrass and n and saligrass make up about 10 percent. Sedges and forbs make up about 10 percent.

The major management concern on this site is maintaining the most productive grasses. After continued overgrazing the amount of the most productive grasses decreases and that of sedges, rushes. Kentucky bidegrass, and inland sattgrass increases. Productivity is tower because of the increase in the amount of the shorter less palatable plants. The most productive grasses can be improved or maintained by using the proper stocking rates along with a rotation grazing or deferred grazing program, which provides rest periods during the key growing seasons of these plants.

# Native Woods, Windbreaks, and Environmental Plantings

Native trees and shrubs grow on about 2,000 acres in the survey area. They generally grow on flood plains along the larger drainageways and on breaks along the deeper drainageways. Some grow along the margins of Red Lake and some of the larger depressions. The sorts that support trees are not classified as woodland sorts. Nearly all of the wooded areas provide habitat for widitle and protection for domestic animals.

Scattered individual plants or clumps of American elm. American plum, boxelder, bur oak, common chokecherry, hackberry, green ash, and western snowberry are common on the Bon Lane and Wendle soils on flood plains. Plains cottonwood and peachieat willow commonly grow adjacent to stream channels and less commonly on the margins of the areas of Worthing and Plankinton soils in depressions. Boxelder, bur oak, and green ash grow on the Betts, Java. Gettys, and Opal soils in drainageways. Eastern redicedar grows on some north facing slopes of the Missouri River breaks.

Windbreaks have been planted since the days of the early selflers. The early windbreaks were planted mainly to protect farmsteads and investock. These kinds of windbreaks are still needed, in recent years field windbreaks have been planted to help control wind erosion. They are still needed in many areas.

Windbreaks protect Irvestock, buildings, and yards from wind and show. They also protect fruit trees and gardens, and they furnish habitat for wildrife. Several tows of low- and high-growing broadleat and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep show on the fields, and provide food and cover for wild, fe.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants mostly evergreen shrubs and trees are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted property on a weil prepared site and maintained in good condition.

Grazing is extremely damaging to windbreaks and environmental plantings because the livestock compact the soil and remove the lower branches of the trees and shrubs. Removal of the lower branches reduces the effectiveness of the windbreaks. Grasses and weeds prevent maximum growth. Clean cultivation and applications of herbicide help to control weeds (fig. 9). Fallowing a year before planting helps to provide a reserve supply of moisture, which is needed before seedlings can be established.

The effectiveness of many of the older windbreaks in the survey area can be improved by planting ponderosa



Figure 9.—Excellent weed control in a windbreak on Uly aift loam, 0 to 2 percent slopes.

pine eastern reddedar, or Rocky Mountain juniper between the existing rows. Also, additional trees can be planted on the edges of the existing beits.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery

#### Recreation

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality. vegetation, access to water, potential water impoundment sites, and access to public sewerines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs, in planning recreation facilities, onsite assessment of the height duration, intensity, and frequency of flooding is essential

In table 9, the degree of soil limitation is expressed as sight, moderate, or severe. Slight means that soil properties are generally favorable and that limitations are minor and easily overcome *Moderate* means that limitations can be overcome or alleviated by planning design or special maintenance. Severe means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfail readily but

remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campates.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when well, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the penod of use. They have moderate slopes and lew or no stones or boulders on the surface

#### Wildlife Habitat

Connie M. Vicune, biologist, Soil Conservation Service, helped prepare this section

Wildlife habitat in Brule and Buffalo Counties is primarily provided by rangeland, cropland, and scattered areas of shallow wellands. The game species include ring-necked pheasant, sharp-tailed grouse, eastern cottontail, whitetail jackrabbit, red fox, coyote, whitetail deer, and mule deer. Numerous species of ducks and geese migrate through the survey area. Fish are abundant in Lake Sharpe and Lake Francis Case.

The distribution and density of wildlife in the survey area are related to the presence or absence of various habitat elements that provide sources of lood and cover. These habitat elements include cropland, grasses and forbs, shrubs, trees, wetlands, rivers, and other water bodies. The general abundance of these habitat elements commonly corresponds to soil associations or groups of associations because each association has a distinctive pattern of soils, relief, and drainage that results in characteristic vegetation and land use patterns. In the following paragraphs, the 14 soil associations described under the heading "General Soil Map Units" are grouped into wildlife areas that differ in the kinds and abundance of wildlife, in the potential for producing habitat elements, and in other environmental factors.

Wildlife area 1 makes up about 62 percent of the survey area. It consists of the Beadle-Plankinton-Eakin, Eakin-DeGrey, Glenham-Java-Highmore, Highmore-Mobridge, Highmore-Java-Glenham, and Oahe-Delmont associations. The amount of cropland ranges from about 75 percent in the Highmore-Mobridge association to 20

percent in the Oahe-Delmont association. Alfaifa, corn, grain sorghum, and small grain are the main crops. The main kinds of wildlife that inhabit this area are gray partridge, eastern cottontall, western meadowlark, mourning dove, and ning-necked pheasant.

Shallow wetlands, which occur as areas of the Plankinton and Worthing soils, provide excellent habitat for migrating waterfowl in the spring. In wetter years they also provide nesting areas for waterfowl. Large wetland areas, such as Red Lake, and stock water impoundments also provide habitat for waterfowl in most years. Mallard, blue-winged teal, shoveler, American widgeon, pintail, mink, muskrat, and great blue heron are among the species that inhabit these areas

Planted windbreaks provide most of the available woody cover. Native trees and shrubs that grow along Smith Creek and other small drainageways also provide some woody cover. Grassy cover is available around most wetlands and in areas of the Beadle-Plankinton-Eakin and Oahe-Delmont associations. Rangeland wildlife species that inhabit this area include lark bunting, sharp-tailed grouse, and whitetail jackrabbit. Deer are most abundant near the wooded areas and around Red Lake and other large wetland areas. Predators, such as red lox coyote badger skunk and raccoon are throughout this wildlife area. Wildlife habitat can be improved by planting trees and shrubs and leaving undisturbed grassy areas.

Wildlife area 2 makes up about 8 percent of the survey area. It consists of the Lowry-Suily and Uty associations. The amount of cropland is about 60 percent in the Lowry-Suily association and 90 percent in the Uty association. Some of the cropland is impated. The main wildlife species are gray partridge, eastern cottontall mourning dove, and ring-necked pheasant. This area also attracts migrating waterfowl because of its proximity to the Missouri River Deer frequently forage in cropland areas near the Missouri River breaks. Predators include coyote, red fox, badger, skunk, and the prame rattlesnake.

The steeper areas of the Sully soils on the breaks along the Missouri River are used primarily for range. They provide most of the natural cover in this area. Also, several state game production areas provide excellent wildlife habitat.

Wildlife area 3 makes up about 15 percent of the survey area. It consists of the Betts-Java, Okaton, and Sansarc-Opal-Chantier associations. Nearly all of this area is range. Because of the slope and the shallow depth to shale in some areas, most of the soils generally are suited only to range. Areas of shale outcrop are interspersed with the range. They do not support vegetation. The deep draws support thick stands of woody plants. American, Crow, Elm, Little Elm, Soldier, and Campbell Creeks are in this area. Mule deer, whitetail deer, and bobcat inhabit the breaks along the Missouri Filver. The western magpie inhabits cedar.

thickets in the draws. The flood plains provide habitat for beaver wild turkey cottonian rabbits red fox and a variety of songbirds. This area has a large concentration of coyotes. The praine rattieshake also is common especially near prairie dog towns.

Windlife area 4 makes up about 1 percent of the survey area it is the Durrstein Egas association on flood plains dissected by stream channels. Only about 5 percent of this area is cultivated. Most of the acreage is range or hayland. The grass cover is sparse because of same soil characteristics and compaction caused by irvestock. Wildlife species common to this area are the upland plover killdeer sharp-tailed grouse mourning dove and whitetail jackrabbil.

Open water areas in the stream channels provide habitat for wetland wilderle. Mailards, blue-winged teal, and red-winged blackbirds nest along the channels. Great blue herons also inhabit these water areas.

Wildlife area 5 makes up about 14 percent of the survey area. It consists of the Opal saline Promise and Promise-Opal associations. Most of the Opal saline-Promise association is range, and about 40 percent of the Promise-Opal association is range. Alfalfa, small gram, and sorghum are the main crops. Parts of Crow, E.m. Smith, and Soidier Creeks are in this area. Sharptailed grouse liark bunting, meadowlark, whitefall jackrabbit, and praine dogs are the main wildlife species in this area. Deer turkey eastern cottontail songbirds, and red lox inhabit the wooded areas on some flood plains.

Grouping the associations into these wildlife areas provides a broad indication of the potential for managing the wildlife habitat in the counties. When habitat development and management for a specific site are planned the capabilities of the individual soils on the site should be considered. Individual soils have different potentials for development and maintenance of the wildlife habitat elements. The soil therefore affects the degree or extent to which wildlife habitat can be established or improved. In table 10 the soils in the survey area are rated according to their potential for providing each of the wildlife habitat elements. The ratings as described in the for owing paragraphs, indicate the ease of establishing or maintaining these elements.

The potential of the soil is rated good, tair poor or very poor. A rating of good indicates that the element is easily established improved or maintained fiew or no limitations affect management, and satisfactory results can be expected. A rating of fair indicates that the element can be established, improved or maintained in most piaces. Moderately intensive management is required for satisfactory results. A rating of poor indicates that limitations are severe for the designated element. The element can be established improved, or maintained in most piaces, but management is difficult and must be intensive. A rating of very poor indicates.

that restrictions for the element are very severe and that unsatisfactory results can be expected. Establishing, improving or maintaining the element is impractical or impossible.

The elements of wildlife habital are described in the following paragraphs

Grain and seed crops are domestic grains and seedproducing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface tayer available water capacity, wetness slope surface atominess and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barriey.

Grasses and legumes are domestic perennial grasses and herbaceous regumes. Soil properties and features that affect the growth of grasses and regumes are depth of the roof zone fexture of the surface layer available water capacity, wetness surface storiness, flood hazard and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and regumes are sovegrass, bromegrass, clover, and alfaita.

Wild herbaceous plants are native or naturally established grasses and forbs including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone fexture of the surface layer available water capacity wetness surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestern, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds catkins, twigs, bark, and forage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak popiar cherry apple hawthorn, and dogwood. Examples of fruit producing shrubs that are suitable for planting on soils rated good are Russian-olive, and crabappie.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees shrubs and ground cover are depth of the root zone, available water capacity, and wetness Examples of coniferous plants are pine, spruce, and junioer.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or well sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer wetness reaction salinity slope and surface storiness. Examples of welland plants are smartweed wild miller saltgrass cordgrass, rushes sedges, and reeds.

Sharlow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water control.

structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

Information concerning the elements needed to maintain and manage specific wildlife species can be obtained from the local office of the Soil Conservation Service or from the South Dakota Department of Game, Fish and Parks.

## Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables. Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the Soil Properties, section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet Bacause of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel expenenced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness depth to a seasonal high water table slope, akelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and sit fractions, and the kind of adsorbed cations. Estimates were made for erodibility permeability, corrosivity shinik-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of

construction conditions, (3) evaluate alternative routes for roads, streets highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfilts, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology, (6) locate potential sources of graver sand, earthfill and topsoil; (7) plan drainage systems imigation systems, ponds, terraces, and other structures for soil and water conservation, and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Giossary

### **Building Site Development**

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered slight if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome: moderate it soil properties or site features are not favorable for the indicated use and special planning, design or maintenance is needed to overcome or minimize the imitations, and severe it soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utirty lines open ditches and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, fitting, and compacting is affected by the depth to bedrock a cemented pain or a very firm dense layer stone content, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stones. Ratings are made for small commercial buildings without basements for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties site features, and observed performance of the soils. A high

water table, flooding, shrink-swell potential, and organic layers can cause the movement of foolings. A high water lable depth to bedrock or to a cemented pan large stones, slope, and flooding affect the ease of excavation and construction, landscaping and grading that require cuts and files of more than 5 to 6 feet are not considered.

Local roads and streets have an all weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fit soil material, a base of gravel crushed rock or stabilized soil material, and a flexible or rigid surface. Cuts and lies are generally similed to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pain, a high water table flooding large stones, and slope affect the ease of excavating and grading. Soil strength its inferred from the engineering classification of the soils shinkly swell potential. Irost action potential, and depth to a high water table affect the traffic supporting capacity.

#### **Sanitary Facilities**

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary andfilis. The imitations are considered slight if soil properties and site features are generally tavorable for the indicated use and limitations are minor and easily overcome important if soil properties or site features are not tavorable for the indicated use and special planning, design or maintenance is needed to overcome or minimize the limitations, and severe if soil properties or site features are so unlavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of good indicates that soil properties and site features are favorable for the use and good performance and ow maintenance can be expected fair indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good, and poor indicates that one or more soil properties or site features are unlavorable for the use and overcoming the unlavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption helds are areas in which eliment from a septic tank is distributed into the soil through subsurface hies or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields including excessively slow absorption of effluent, surfacing of effluent, and his side seepage, can affect public health. Ground water can be politited if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field it slope is excessive or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons (aerobic) are shallow ponds constructed to hold sewage while aerobic bacterial decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soir Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet intensity impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of pround water.

Table 12 gives ratings for the natural soil that makes up the agoon floor. The surface layer and generally 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties site features, and observed performance of the soils. Considered in the ratings are slope permeability a high water lable depth to bedrock or to a cemented pair flooding large stones and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Poliution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because if inhibits aerobic activity. Slopo bedrock, and camented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Senitary tendrills are areas where solid waste is disposed of by burying it in soil. There are two types of tandition trench and area in a trench landler, the waste is praced in a trench it is spread compacted and covered daily with a thin layer of soil excavated at the site. In an area randfill, the waste is praced in successive layers on the surface of the soil. The waste is spread compacted and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site leatures, and observed performance of the soils. Permeability depth to bedrock or to a cemented pan, a high water table slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic.

layers, soli reaction, and content of salts and sodium affect trench type tandfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or sitty soils that are free of large stones or excess gravel are the best cover for a tandfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

#### **Construction Materials**

Table 13 gives information about the soils as a source of roadiil, sand, gravel, and topsoil. The soils are rated good, fair, or poor as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 feet. It is assumed that soil tayers will be moved during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with time or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water

table, and slope. How wall the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shink-swell potential

Soils rated good contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbies and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated far are more than 35 percent sitt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated poor have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other sods are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fartility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have triable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts.

are naturally fertile or respond well to fertilizer, and are not so well that excavation is difficult.

Soils rated fair are sandy soils, loamy soils that have a refatively high content of ctay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble saits, or soils that have stopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soits rated poor are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

#### Water Management

Table 14 gives information on the soil properties and site leatures that affect water management. The degree and kind of soil imitations are given for pond reservoir areas and for embankments dikes and levees. The limitations are considered slight if soil properties and site leatures are generally lavorable for the indicated use and limitations are minor and are easily overcome moderate if soil properties or site features are not tavorable for the indicated use and special planning, design or maintenance is needed to overcome or minimize the limitations and severe if soil properties or site features are so unlavorable or so difficult to overcome that special design significant increase in construct on costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage irrigation terraces and diversions and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embanisments, dikes and levees are raised structures of sowmaterial generally less than 20 feet high constructed to impound water or to protect and against overflow in this table the sows are rated as a source of material for embanisment fill. The ratings apply to the sost material below the surface layer to a depth of about 5 feet. It is assumed that sow tayers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural sor to support an embankment. Soil properties to a

depth even greater than the height of the embankment can affect performance and safety of the embankment Generally deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistent to seepage piping and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable materia and a high content of stones or boulders organic matter or salts or sodium. A high water table affects the amount of usable material It also affects trafficability.

Dramage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock to a cemented pan or to other layers that affect the rate of water movement permeability depth to a high water table or depth of standing water if the soil is subject to ponding slope susceptibility to flooding subsidence of organic layers and potential frost action Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones slope and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone such as saits sodium or suitur. Availability of drainage outlets is not considered in the ratings.

Impation is the controlled application of water to supplement raintal and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage flooding available water capacity, intake rate permeability erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of saits or sodium, and so reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness large stones and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels generally broad and shallow that conduct surface water to outlets at a nonerosive velocity Large stones wetness, stope and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity restricted rooting depth, toxic substances such as saits or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

# Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 18.

Estimates of soil properties are based on field examinations, on aboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables notice the range of grain-size distribution and Atterberg inits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given

## **Engineering Index Properties**

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 10). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

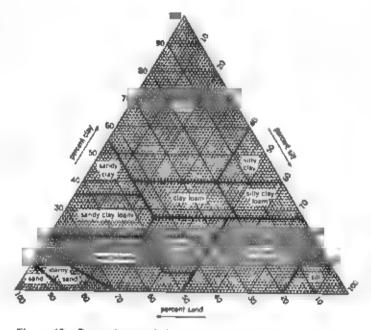


Figure 10.—Percentages of clay, silt, and eand in the basic USDA soil textural classes.

Classification of the soils is determined according to the Unified soil classification system (2) and the system adopted by the American Association of State Highway and Transportation Officials (1)

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid unit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content

of fines (sift and clay). At the other extreme, soils in group A 7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-5, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 18.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to

weight percentage

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4,76, 2,00,0,420, and 0,074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and plasticity index (Alterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or

from nearby areas and on field examination.

The estimates of grain-size distribution liquid limit and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

## Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Permeability refers to the aborty of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of

water and the depth of the root zone. The most important properties are the content of organic matter soil fexture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in phi values. The range in phi of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salarity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract in minimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonrigated soils. The salarity of imigated soils is affected by the quality of the imigation water and by the frequency of water application. Hence the salarity of soils in individual fields can differ greatly from the value given in the table. Salarity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode meta, and concrete.

Shink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high shrinking and swelling can cause damage to buildings roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 mi limeters in diameter. The classes are low a change of less than 3 percent, moderate. 3 to 6 percent, and high, more than 6 percent. Very high greater than 9 percent, is sometimes used.

Frosion factor k indicates the susceptibility of a soil to sheet and nit erosion by water. Factor K is one of six factors used in the Universal Soil closs Equation (USLE) to predict the average annual rate of soil loss by sheet.

and nill erosion in tons per acre per year. The estimates are based primarily on percentage of sit, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K in this survey area range from 0.10 to 0.43. The higher the value, the more susceptible the soil is to sheet and nill erosion by water

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by who or water that can occur without affecting crop productivity over a sustained period. The rate is in toris per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. Soils are grouped according to the following distinctions.

- 1 Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
- 2 Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
- 3 Sandy loams coarse sandy loams fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
- 4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.
- 4. Clays, sity clays, clay loams, and sity clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.
- 5 Loamy soils that are less than 18 percent day and fess than 5 percent finely divided calcium carbonate and sandy day loams and sandy days that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.
- 6 Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate. except sity clay loams. These soes are very sightly erodible. Crops can easily be grown.
- 7 Sity clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.
- 8 Stony or gravelly soils and other soils not subject to wind erosion

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in chameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity of itration rate, and titth, it is a source of nitrogen and other nutrients for crops.

#### Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoif from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly well and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravely sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately wen drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or line texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potentia) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding the temporary mundation of an area, is caused by overflowing streams, by runoff from adjacent alopes, or by tides. Water standing for short periods after ramfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare occasional and frequent. None means that flooding is not probable rare that it is unlikely but possible under unusual weather conditions, occasional that it occurs, on the average once or less in 2 years, and frequent that it occurs, on the average, more than once in 2 years. Duration is expressed as very brief if less than 2 days, brief if 2 to 7 days, and long if more than 7 days.

Probable dates are expressed in months, November-May, for example, meens that flooding can occur during the period November through May

The information is based on evidence in the soil profile inamely thin strata of gravel, sand, silt, or clay deposited by floodwater, irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each sox on the landscape to historic floods. Information on the extent of flooding based on sox data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An apparent water table is a thick zone of free water in the soil it is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A perched water table is water standing above an unsaturated zone. In places an upper or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes or small hippers. If the rock is hard or massive biasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil Temperature texture density permeability content of organic matter and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Sifty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other hold structures.

Hisk of corresion pertains to potential soli-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corresion of uncoated steel is related to such factors as soli moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corresion of concrete is based mainly on the sulfate and sodium content, fexture, moisture content, and acidity of the soil Special site examination and design may be needed if the combination of factors creates a severe corresion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corresion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoaled steel the risk of corrosion expressed as low moderate or high is based on soil drainage class, total acidity electrical resistivity near field capacity and electrical conductivity of the saturation extract

For concrete, the risk of corrosion is also expressed as low, moderate, or high. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

## Engineering Index Test Data

Table 18 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the senes described in the section. Soil Series and Their Morphology. The soil samples were tested by the South Dakota Department of Transportation. Division of Highways.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM)

The tests and methods are AASHTO classification—M 145 (AASHTO) D 3282 (ASTM) United classification—D 2487 (ASTM) Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM) and Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM)

# Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (11) Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in soil. An exercise is Malliant.

example is Mollisol

SUBORDER Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustoll (Ust, meaning intermittent dryness, plus off, from Motlisol).

GREAT GROUP Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons, soil moisture and temperature regimes, and base status. Each great group is identified by the name of a suborder and by a prefix that Indicates a property of the soil. An example is Hapfustotts (Hapf, meaning minimal horizonation, plus ustolf, the suborder of the Mollisols that have an ustic moisture regime).

SUBGROUP Each great group has a typic subgroup Other subgroups are intergrades or extragrades. The typic is the central concept of the great group, it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective Typic identifies the subgroup that typities the great group. An example is Typic Haplustolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soci properties. An example is fine-sity, mixed, mesic Typic Haplustolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

## Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it termed are identified for each senes. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the senes in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (9). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (11). Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

#### Artesian Series

The Artesian series consists of deep, somewhat poorly drained soils formed in sitty and clayey alluvium in upland basins. Permeability is slow. Slopes are less than 1 percent.

Artesian soils commonly are near Bon, Farmsworth, Lane, and Worthing soils. The moderately well drained Bon and Lane soils are slightly higher on the landscape than the Artesian soils. Farmsworth soils have a natric horizon. They are in positions on the landscape similar to those of the Artesian soils. The very poorly drained Worthing soils are in depressions.

Typical pedon of Artesian ailty clay foam, 805 feet east and 1 980 feet north of the southwest corner of sec. 19. T. 103 N., R. 70 W.

Ap—0 to 5 inches; dark gray (10YR 4/1) sitty clay loam, very dark gray (10YR 3/1) moist; weak medium and fine subangular blocky structure parting to weak fine granular hard, firm stricky and plastic militaly alkaline abrupt smooth boundary.

Bw1—5 to 10 inches; dark gray (10YF 4/1) sity clay, very dark gray (10YF 3/1) moist; few fine and medium prominent strong brown (7 5YF 5/8) motites, moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky extremely hard, very firm, very sticky and very plastic, mildly alkaline, abrupt wavy boundary.

Bw2—10 to 17 inches; gray (10YR 5/1) sity clay, very dark graytah brown (2.5Y 3/2) moist, lew fine and medium prominent strong brown (7.5YR 5/8) motiles, moderate coarse priamatic structure parting to moderate medium and coarse subangular blocky; extremely hard, very firm very sticky and very plastic shiny surfaces on some peds, lew fine accumulations of carbonate, strong effervescence, midly alkaline; clear wavy boundary.

BCzg—17 to 31 inches, gray (N 5/0) sifty clay very dark grayish brown (2 5Y 3/2) moist; few fine and medium prominent strong brown (7 5YA 5/8) mothes, moderate course pnamatic structure parting to moderate medium and coarse subangular blocky; extremely hard, very firm, very sticky and very prastic few tongues of dark gray (10YR 4/1) material, shiny surfaces on some peds, common fine nests of salts, few fine accumulations of carbonate, strong attervescence, moderately arkatine, graduar wavy boundary.

Czg—31 to 40 inches, light brownish gray (2.5Y 6/2) and dark grayish brown (2.5Y 4/2) silty clay dark grayish brown (2.5Y 4/2) and very dark gray (10YR 3/1) moist, massive extremely hard, very firm, very sticky and very plastic, common fine nests of salts, few fine accumulations of carbonate, strong effervescence, moderately alkaline, clear wavy boundary.

Cg1—40 to 50 inches; light brownish gray (2.5Y 6/2) sity ctay loam, dark grayish brown (2.5Y 4/2) moist; common fine and medium prominent light olive brown (2.5Y 5/4) and black (5Y 2/1) mottles, massive very hard, firm sticky and plastic, common fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary

Cg2—50 to 60 inches light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; common fine and medium prominent light clive brown (2.5Y 5/4) and black (5Y 2/1) mottles; massive; very hard, firm, sticky and plastic; common

fine to coarse accumulations of carbonate strong effervescence

The thickness of the solum ranges from 24 to 36 inches. The thickness of the movic epipedon ranges from 24 to 42 inches. The depth to free carbonales ranges from 4 to 14 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2 it ranges from slightly ackt to mildly alkaline. The 8w horizon has hue of 10YR or 25Y, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2 it ranges from neutral to moderately alkaline. The C horizon has hue of 25Y or 5Y value of 4 to 6 (3 to 5 moist), and chroma of 1 to 3, it is mildly alkaline or moderately alkaline.

### Beadle Series

The Beadle series consists of deep well drained soils formed in clay loam glacial till on uplands. Permeability is moderately slow. Slopes range from 1 to 9 percent.

Beadle soils are similar to Oko soils and commonly are near DeGrey Eakin Highmore perauld. Plankinton, and Worthing soils. DeGrey and perauld soils have a natric horizon. They are in small depressions. Eakin and Highmore soils contain less diay and more sift in the subsoil than the Beadle soils. They are in positions on the landscape similar to those of the Beadle soils. Oko soils contain more diay in the subsoil than the Beadle soils. The poorty drained Plankinton soils and the very poorty drained Worthing soils are in depressions.

Typical pedon of Beadle loam, in an area of Beadle-Jerauld complex 1 to 5 percent slopes, 70 feet south and 900 feet east of the northwest corner of sec 33 T 101 N , R 68 W

A=0 to 6 inches, dark gray (10YR 4/1) loam, very dark gray (10YR 3-1) moist, weak medium and fine subangular blocky structure parting to weak line granular slightly hard finable slightly sticky common very fine roots, neutral, clear smooth boundary.

Bt—6 to 12 inches, dark grayish brown (10YR 4/2) clay loam very dark grayish brown (10YR 3/2) moist, moderate coarse prismatic structure parting to moderate medium subangular brocky hard firm, siightly slicky and slightly plastic few line and medium dark gray (10YR 4/1) longues of the A horizon; common very line roots, neutral gradual waivy boundary.

BCk1—12 to 16 inches; grayish brown (2.5Y 5/2) cray loam, dark grayish brown (2.5Y 4.2) moist, moderate coarse prismatic structure parting to moderate medium subangular blocky very hard firm, sticky and slightly plastic few fine and medium dark gray (10YR 4/1) tongues of the A horizon, common fine and medium accumulations of

carbonate common very fine roots strong effervescence moderately alkaline clear wavy boundary

BCk2—16 to 23 inches grayish brown (2.5Y 5/2) clay loam dark grayish brown (2.5Y 4/2) moist few line distinct redd shiyellow (7.5YR 6/6) mottles, weak coarse prismatic structure parting to weak medium subangular blocky very hard, firm, sticky and slightly plastic, few fragments of shale, many medium accumulations of carbonate, common very fine roots, strong effervescence, moderately alkaline, gradual wavy boundary.

Ck 23 to 33 inches light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist few fine distinct reddish yellow (7.5YR 6/6) mottles massive, very hard firm sticky and slightly plastic few fragments of shale many moderate accumulations of carbonate few fine roots strong effervescence moderately alkaline clear wavy boundary.

C1—33 to 49 inches light brownish gray (2.5Y 6-2) clay loam grayish brown (2.5Y 5.2) moist lew fine distinct reddish ye low (7.5YR 6.6) mothes massive, hard, firm slightly stickly and slightly prastic few fragments of shale few fine and medium accumulations of carbonate few very fine roots strong effervescence, moderately alkaline gradual wavy boundary.

C2—49 to 60 inches, light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist common fine distinct gray (10YR 6.1) and few fine distinct reddish yellow (7.5YR 6.6) mottles massive hard firm slightly sticky and slightly plastic few shale chips, common fine nests of gypsum strong effervescence, moderately alkaline.

The thickness of the solum ranges from 21 to 29 inches. The depth to free carbonates is 12 to 15 inches. The thickness of the movic epipedon also is 12 to 15 inches.

The A horizon has value of 4 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid or neutral. The 8th horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It is neutral or middy alkaline. The C horizon has hue of 2.5Y or 5Y value of 5 or 6 (4 to 6 moist), and chroma of 2 to 4. It is middly alkaline or moderately alkaline. The mothes are inherited from the parent materia.

#### **Betts Series**

The Betts series consists of deep well drained soils formed in calcareous, loamy glada, till on uplands. Permeability is moderate in the upper part of the profile and moderately slow in the underlying material. Slopes range from 9 to 40 percent.

Bells soils are similar to Gettys and Java soils soils commonly are near Glenham, Java, and Schamber soils Gettys soils contain more clay throughout than the Belts

soils. Glenham and Java soils have a molfic epipedon. Glenham soils generally are on the less sloping parts of the landscape. Schamber soils have gravelly material within a depth of 10 inches. They are in positions on the landscape similar to those of the Betts soil.

Typical pedon of Betts Joam (fig. 11) in an area of Betts Java Joams, 20 to 40 percent slopes, 90 feet north and 750 feet east of the southwest corner of sec. 24, T. 108 N. R. 70 W.

- A—0 to 3 inches, dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moret weak fine granular structure soft very finatie, many very finaroots strong effervescence, moderately alkaline, clear smooth boundary.
- ACk = 3 to 8 inches, light brownish gray (10YR 6/2) clay loam dark brown (10YR 4/3) moist, weak medium subangular blocky structure parting to moderate line granular slightly hard, friable common very fine roots, common line accumulations of carbonate strong effervescence, moderately alkaline gradual wavy boundary.
- Ck = 8 to 25 inches, grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist liveak medium and coarse subangular blocky structure slightly hard, friable slightly sticky and slightly plastic, common very fine roots, common fine and medium accumulations of carbonate strong efforvescence, moderately alkaline gradual wavy boundary.
- C1—25 to 40 inches light yellowish brown (2.5Y 6/4) clay loam olive brown (2.5Y 4/4) moist lew fine distinct brownish yellow (10YR 6/6) mottles, massive hard friable slightly sticky and slightly plastic few very fine roots few line fragments of shale common fine accumulations of carbonata strong effervescence moderately alkaline, gradual wavy boundary.
- C2—40 to 52 inches light vellowish brown (2.5Y 6/4) clay loam idark grayish brown (2.5Y 4/2) and olive brown (2.5Y 4/4) moist, lew fine distinct brownish yellow (10YR 6/6) mothes hard triable slightly sticky and slightly plastic, lew fragments of shale, few fine and medium nests of gypsum few fine accumulations of carbonate strong effervescence, moderately alkaline gradual wavy boundary.
- C3—52 to 60 inches light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; tew fine distinct olive (5Y 4/4) moittes, massive hard finable, slightly sticky; common medium and coarse nests of gypsum strong effervescence moderately alkalina.

The solum is less than 10 inches thick. Typically free carbonales are at the surface, but some pedons are leached to a depth of 3 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It ranges from neutral to moderately

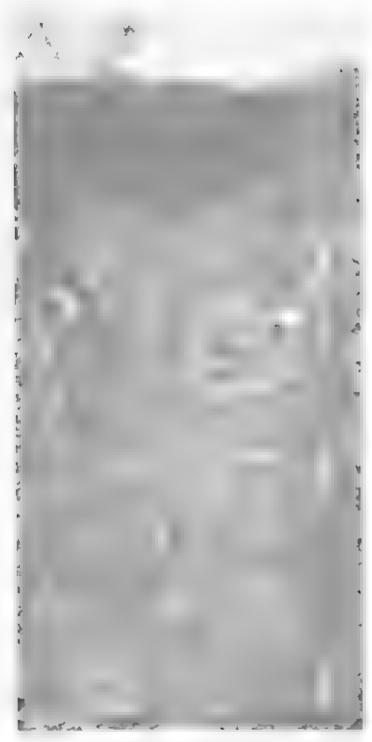


Figure 11.—Profile of Betts loam. The surface layer is about 3 inches thick.

alkaline. Some pedons have a loam or clay loam 8w horizon that has value of 5 or 6 (4 or 5 moist) and

chroma of 2 or 3. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. It is loam or clay loam. The mottles are inherited from the parent material.

#### **Bon Series**

The Bon series consists of deep, well drained and moderately well drained soils formed in alluvium on terraces and flood plains. Permeability is moderate. Slopes range from 0 to 2 percent.

Bon soils commonly are near Durrstein, Egas, Lane, Oahe, and Ree soils. The poorly drained Durrstein and Egas soils contain more salts throughout than the Bon soils. They are on the low parts of the flood plains. Lane soils contain more clay throughout than the Bon soils. They are in positions on the landscape similar to those of the Bon soils. Oahe and Ree soils are slightly higher on the landscape than the Bon soils. Oahe soils are 20 to 40 inches deep to gravelly material. Ree soils have an argillic horizon.

Typical pedon of Bon loam, 640 feet east and 1,290 feet north of the southwest corner of sec. 8. T 105 N , R 67 W

A1—0 to 3 inches, dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak thin platy structure parting to weak fine granular; soft, very friable; common very fine roots, neutral: clear smooth boundary

A2—3 to 14 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist, weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; common very fine roots, neutral; clear wavy boundary

A3—14 to 23 inches, grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse and medium subangular blocky structure; slightly hard, very friable, common very fine roots; common fine and medium accumulations of carbonate, strong effervescence; moderately a kaline; abrupt wavy boundary

A4—23 to 28 inches, dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist; weak coarse and medium subangular blocky structure; slightly hard, very friable, common very fine roots, few fine accumulations of carbonate; strong effervescence; moderately alkaline, clear wavy boundary

C1—28 to 41 inches; pale brown (10YR 6/3) day loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, firm, slightly sticky, few very fine roots, few fine accumulations of saits, few fine accumulations of carbonate; strong effervescence; moderately alkaline, clear wavy boundary

C2—41 to 51 inches, light brownish gray (2.5Y 6/2) sity clay loam, dark gravish brown (10YR 4/2) moist;

massive slightly hard, firm slightly sticky few very fine roots few line accumulations of carbonate strong effervescence moderately alkaline, gradual

wavy boundary

C3—51 to 60 inches light brownish gray (2.5Y 6/2) clay loam, dark brown (10YR 4/3) moist, massive; slightly hard, firm, slightly sticky, few very line roots, common fine and few medium accumulations of carbonate, strong effervescence, moderately alkaline.

The depth to free carbonates ranges from 0 to 20 inches. The thickness of the mollic epipedon ranges from 20 to 40 inches.

The A horzon has hue of 10YR or 2.5Y value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It dominantly is toam but in some pedons is silt loam. It ranges from neutral to moderately alkaline. The C horzon has value of 3 to 7 (2 to 5 moist) and chroma of 1 to 3. It is stratified fine sandy loam, loamly line sand, silt loam, silty clay loam, or day loam. It is mildly alkaline or moderately a kaline. Mottles are below a depth of 30 inches in some pedons.

### **Bulicreek Series**

The Bullcreek series consists of deep moderately well drained soils formed in clayer anurum in vallers, on fans, and on low terraces. When dry these soils are characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil Permeability is very slow. Slopes range from 0 to 4 percent.

Bullcreek soils commonly are near Hurley Opal Promise and Sansarc soils. Hurley and Promise soils are in positions on the landscape similar to those of the Bullcreek soils. Hurley soils have a natric horizon. Opal and Promise soils are not so dense as the Bullcreek soils. Also, Opal soils are slightly higher on the landscape. They are 20 to 40 inches deep to shale. Sansarc soils are 4 to 20 inches deep to shale. They are on ridges and on the sides of drainageways.

Typical pedon of Bullcreek clay 500 feet south and 125 feet east of the northwest corner of sec. 11 T. 106

N . R 69 W

A=0 to 2 nches, grayish brown (10YR 5/2) clay very dark grayish brown (10YR 3/2) moist, weak fine and medium granular structure hard firm sticky and plastic, common fine roots, mildly alkaline clear smooth boundary.

Bw---2 to 12 inches, gray (10YR 5/1) clay very dark gray (10YR 3/1) moist, weak coarse subangular blocky structure parting to weak medium subangular blocky extremely hard firm sticky and plastic few fine roots strongly a kakine: gradual wavy boundary

Bz -12 to 24 inches, grayish brown (2.5Y 5/2) clay dark grayish brown (2.5Y 4/2) moist, weak coarse

subangular blocky structure parting to weak medium subangular blocky extremely hard, firm, sticky and plastic, many tine and medium nests of gypsum and other saits, few fine roots, moderately alkaline, gradual wavy boundary.

C1—24 to 42 inches grayish brown (2.5Y 5/2) clay dark grayish brown (2.5Y 4/2) moist; massive very hard firm sticky and plastic, few fine roots common fine and medium nests of gypsum and other salts, strongly alkeline, gradual wavy boundary.

C2—42 to 51 inches, grayish brown (2.5Y 5/2) clay dark grayish brown (2.5Y 4/2) moist massive very hard, firm sticky and plastic many fine to coarse nests of gypsum and other salts, strongly alkaline, gradual wavy boundary.

C3—51 to 60 inches, grayish brown (2.5Y 5/2) clay dark grayish brown (2.5Y 4/2) moist massive very hard firm, sticky and plastic, moderately alkaline

The thickness of the solum ranges from 10 to 24 inches. Free carbonates are at the surface in some pedons. Visible salts are within a depth of 20 inches.

The A horizon has hue of 2.5Y or 10YR value of 4 or 5 (3 moist) and chroma of 1 or 2. It ranges from neutral to moderately alkaline. The B horizon has hue of 10YR, 2.5Y or 5Y value of 5 or 6 (3 or 4 moist), and chroma of 1.10.3 It ranges from mildly alkaline to strongly alkaline.

#### Carter Series

The Carter series consists of deep moderately well drained soils formed in clayey material on uplands and terraces. Permeability is very slow. Slopes range from 0 to 3 percent.

These soils are taxadjuncts to the Carter series because they are not characterized by an abrupt textural change between the A and 8 horizonta Also, they contain less clay in the 8 horizon than is definitive for the Carter series.

Carter soils are similar to Hurley and Jerauld soils and commonly are near Opal and Promise soils. Hurley and Opal soils are 20 to 40 inches deep over shale. Opal soils are slightly higher on the landscape than the Carter soils. Jerauld soils formed in clay loam glacial till. Promise soils do not have an argillic horizon. They are in positions on the landscape similar to those of the Carter soils.

Typical pedon of Carter silt loam, 95 feet east and 2 140 feet south of the northwest corner of sec. 32. T 108 N R 72 W

A=0.10 4 inches gray (10YR 5/1) sitt loam very dark gray (10YR 3/1) moist weak thin platy structure parting to weak fine granular soft very finable, common fine roots, neutral, abrupt smooth boundary.

- Bi1—4 to 7 inches; dark gray (10YR 4/1) sity clay, very dark gray (10YR 3/1) moist; weak medium columnar structure; very hard, very firm, sticky and plastic, common fine roots; mildly alkaline; clear wavy boundary
- Bt2—7 to 11 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse prismatic structure parting to weak medium and coarse subangular blocky very hard, very firm, sticky and plastic; mildly alkaline, abrupt wavy boundary.
- BC—11 to 18 inches, grayish brown (2.5Y 5/2) clay very dark grayish brown (10YR 3/2) moist, weak medium and coarse prismatic structure parting to weak medium and coarse subangular blocky hard, very tirm sticky and plastic strong effervescence moderately alkaline, gradual wavy boundary.
- Ck—18 to 25 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (10YR 4/2) moist, massive hard, firm, sticky and plastic; few fine roots; few fine accumulations of carbonate, strong effervescence; middy alkaline; clear wavy boundary
- Ckz-25 to 56 inches, light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; common fine accumulations of carbonate and few fine accumulations of salts, strong effervescence; moderately alkaline; gradual wavy boundary.
- C-56 to 60 inches, light olive gray (5Y 6/2) clay, dark grayish brown (2 5Y 4/2) moist; massive; hard, firm, sticky and plastic; few fine accumulations of carbonate; strong affervescence; mildly alkaline.

The thickness of the solum ranges from 15 to 28 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches. The depth to free carbonates ranges from 10 to 23 inches.

The A horizon has value of 4 or 5 (3 moist) and chroma of 1 or 2. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 to 4 moist), and chroma of 1 or 2. It ranges from mildly alkaline to strongly alkaline. The C horizon has value of 5 or 6 (4 or 5 moist) and chroma of 1 to 3

### Cavo Series

The Cavo senes consists of deep, moderately well drained sons formed in loamy glacial till on uplands. Permeability is slow. Slopes range from 0 to 3 percent.

Cavo soils are similar to DeGrey and Farmsworth soils and commonly are near Eakin. Jerauld, Millboro Promise and Ree soils DeGrey soils contain less sand in the argillic horizon than the Cavo soils. The well drained Eakin Milboro, Promise, and Ree soils do not have a natric horizon. They are higher on the landscape than the Cavo soils. Farmsworth soils are dark to a depth of more than 20 inches. Jerauld soils have visible

satts within a depth of 16 inches. They are in small pris and depressions

Typical pedon of Cavo silt loam, in an area of Cavo-Jerauld silt loams, 120 feet west and 900 feet north of the southeast corner of sec. 28, T. 107 N., R. 69 W

- A—0 to 4 inches; dark gray (10YR 4/1) sitt loam, very dark gray (10YR 3/1) most; weak fine granular structure; soft, very friable; many very fine and few line roots; neutral; clear smooth boundary
- E—4 to 8 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist, weak and moderate thin piaty structure; soft, very friable; common very fine and few fine roots, neutral abrupt smooth boundary
- 8t1—8 to 10 inches, dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium columnar structure parting to moderate medium subangular blocky, very hard firm, sticky and plastic, common very fine and few fine roots, mildly alkaline; clear smooth boundary.
- 8t2—10 to 14 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; moderately alkaline; gradual smooth boundary
- Bi3—14 to 19 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure very hard firm, sticky and plastic common very tine roots, moderately alkaline, gradual smooth boundary.
- 8Ckz—19 to 27 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; very hard, triable, sticky and plastic; few fine accumulations of carbonate; few fine nests of salts; few very fine roots, strong effervescence; moderately sikeline; gradual smooth boundary.
- Ck2—27 to 41 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, sticky and plastic; common fine accumulations of carbonate; common fine nests of salls, few very fine roots strong effervescence, moderately alkalime, gradual smooth boundary
- C—41 to 60 inches light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist few fine distinct yellowish brown (10YR 5/6) and very dark brown (10YR 2/2) motiles massive, very hard friable, sticky and plastic, common fine and medium accumulations of carbonate; few line nests of salts; few very fine roots, strong effervescence, moderately alkaline.

The thickness of the solum ranges from 16 to 38 inches. The depth to free carbonates ranges from 10 to

20 inches. The molic epipedon is less than 20 inches thick

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid or neutral. The E horizon has value of 5 to 7 (3 or 4 moist) and chroma of 1 or 2. It is slightly acid or neutral. The Bt horizon has hue of 10YR or 2 5Y value of 4 or 5 (3 or 4 moist) and chroma of 1 or 2. It averages as low as 35 percent clay in some pedons and as high as 50 percent clay in others. It is mildly alkaline or moderately alkaline. The C horizon has hue of 2 5Y or 5Y value of 5 to 7 (4 to 8 moist), and chroma of 2 to 4. It is moderately alkaline or strongly alkaline.

#### Chantler Series

The Chantier series consists of shallow, well drained soils formed in clayey shall residuum on uplands. Permeability is very slow. Slopes range from 2 to 15 percent.

Chantier soils commonly are near Buildreek. Opal, and Sansard soils. Buildreek soils do not have shale within a depth of 40 inches. They are on fans and along drainageways. Opal soils contain tess salls than the Chantier soils and are 20 to 40 inches deep to shale. They are in positions on the landscape similar to those of the Chantier soils. Sansard soils contain less saits than the Chantier soils and are not so firm. They are on the steeper parts of the landscape.

Typical pedon of Chariter clay, in an area of Chariter-Sansarc clays, 2 to 15 percent slopes, 135 feet west and 1,060 feet north of the southeast corner of sec. 11, T 105 N., R. 71 W

- A--0 to 3 inches; grayish brown (2 5Y 5/2) clay, dark grayish brown (2 5Y 4/2) moist; weak medium subangular blocky structure; very hard, very firm, sticky and plastic; few very fine roots; strong effervescence; moderately alkaline; clear wavy boundary
- Bw—3 to 8 inches, grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse and medium subangular blocky structure; extremely hard, extremely firm, sticky and plastic; few very fine roots, strong effervescence, mildly aikakine; clear wavy boundary.
- Ck2—8 to 17 inches; grayish brown (2.5Y 5/2) shaly clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, extremely firm, sticky and plastic; few very line roots; common fine accumulations of gypsum and other salts; common fine accumulations of carbonate; strong effervescence; moderately alkalme; clear wavy boundary.
- Cr—17 to 60 inches, light brownish gray (2.5Y 6/2) shale, dark grayish brown (2.5Y 4/2) moist, common line accumulations of gypsum and other salts, carbonate in seams, strong effervescence; mildly alkaline.

The depth to shale ranges from 10 to 20 inches. The depth to free carbonates ranges from 0 to 8 inches. The dark soil colors are mostly inherited from the shale. The control section averages as low as 60 percent clay in some pedons and as high as 70 percent clay in others.

The A horizon has hue of 2 5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 or 2, it is mildly alkaline or moderately alkaline. The Bw horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 or 2. The C horizon has hue of 2.5Y or 5Y, value of 4 to 8 (3 to 5 moist), and chroma of 1 or 2, it is moderately alkaline or strongly alkaline.

## **DeGrey Series**

The DeGrey series consists of deep, moderately well drained soils formed in sitty material over clay loam glacial till. These soils are on uplands. Permeability is slow. Slopes range from 0 to 3 percent.

DeGrey soils are similar to Cavo and Farmsworth soils and commonly are near Beadle. Eakin, Highmore, Java, and Jerauld soils. Beadle, Eakin, Highmore, and Java soils do not have a natric horizon. They are slightly higher on the landscape than the DeGrey soils. Cavo soils contain more sand in the arguitic horizon than the DeGrey soils. Farmsworth soils are dark to a depth of more than 20 inches usrauld soils have visible salts within a depth of 16 inches. They are in small pits and depressions.

Typical pedon of DeGrey sift toam, in an area of Eakin-DeGrey sift loams, 0 to 3 percent slopes, 40 feet west and 1,060 feet north of the southeast corner of sec, 36, T. 103 N., R. 67 W

- A=0 to 6 inches; dark grayish brown (10YR 4/2) slitloam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse subangular blocky structure parting to weak fine granular soft, very friable; common very fine roots; neutral; clear smooth boundary
- E—6 to 10 inches; grayish brown (10YR 5/2) sill loam, very dark gray (10YR 3/1) moist; weak vary thick platy structure parting to weak fine subangular blocky soft, very friable, common very fine roots, neutral; abrupt wavy boundary
- Bt1—10 to 12 inches; dark grayish brown (10YR 4/2) sity clay, very dark grayish brown (10YR 3/2) moist, moderate medium columnar structure; very hard, very firm, sticky and plastic; common fine roots; moderately alkaline; abrupt wavy boundary
- 812—12 to 20 inches, dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist, moderate medium posmatic structure parting to moderate medium subangular blocky, very hard, very firm, sticky and plastic, shiny surfaces on peds; common very fine roots, moderately alkaine, clear wavy boundary.

BCk—20 to 25 inches; grayish brown (2.5Y 5/2) sity clay foam, dark grayish brown (2.5Y 4/2) moist; wealt medium prismatic structure parting to weak medium subangular blocky hard, firm sticky and plastic common fine roots, common medium accumulations of carbonate few fine accumulations of salts strong effervescence moderately alkaline clear wavy boundary.

Citz1—25 to 33 inches, pale brown (10YR 6/3) sity clay loam, light olive brown (2.5Y 5/4) moist; massive; hard firm siightly sticky and siightly plastic few very fine roots common fine accumulations of carbonate common fine and medium accumulations of sails, strong effervescence moderately alkaline, clear

wavy boundary

Cltz2—33 to 48 inches; pale brown (10YR 6/3) sity clay loam, light olive brown (2.5Y 5/4) moist; many fine and medium faint light brownish gray (10YR 6/2) and few fine distinct brownish yellow (10YR 6/8) mottles massive hard firm slightly sticky and slightly prastic few very fine roots, common fine accumulations of carbonate common fine and medium accumulations of saits, strong effervescence moderately alkahne gradual wavy boundary.

2C ~48 to 60 inches light brownish gray (2.5Y 6/2) clay loam dark grayish brown (2.5Y 4/2) moist common fine distinct light gray (10YR 7/2) and few fine prominent red (2.5YR 4/8) mottles, massive hard, firm sticky and plastic few very fine roots, few fine dark concretions of ron and manganese oxide few time accumulations of salts and gypsim, few fine tragments of shale few line accumulations of carbonate, strong effervescence moderately alkaline.

The thickness of the solum ranges from 23 to 31 inches. The depth to free carbonates ranges from 15 to 22 inches. The thickness of the modic epipedon ranges from 15 to 20 inches. The sodium absorption ratio and percentage of exchangable sodium are 10 to 20 in the natric horizon. The thickness of the sirty material over the loarny glacial till ranges from 30 to 50 inches. The content of fine sand or coarser sand in the sirty material is less than 15 percent.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid or neutral. The E horizon has value of 5 or 6 (3 or 4 moist) and chroma of 1 or 2. It is slightly acid or neutral. The 8t horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 moist), and chroma of 1 or 2. It averages as low as 35 percent clay in some pedons and as high as 50 percent clay in others. It ranges from neutral to moderately sikaline. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. The 2C horizon has value of 5 to 7 (4 or 5 moist) and chroma of 2 to 4.

#### **Delmont Series**

The Delmont series consists of somewhat excessively drained soils that are shallow over gravelly sand. These soils formed in loamy a uvium over gravelly sand. They are on outwash plains and terraces. Permeability is moderate in the solum and rapid in the underlying material. Slopes range from 2 to 15 percent.

Demont soils are similar to Oahe Orion and Schamber soils and commonly are near Oahe Ree and Schamber soils. Oahe and Orion soils are 20 to 40 inches deep over graveily material. Ree soils do not have graveily material within a depth of 40 inches. They are slightly lower on the landscape than the Demont soils. Schamber soils have graveily material within a depth of 10 inches.

Typical pedon of Delmont loam, in an area of Oahe-Delmont loams, 2 to 6 percent slopes, 1 050 feet south and I50 feet west of the northeast corner of sec. 16 T 107 N. S. 68 W.

- A=0 to 4 inches dark grayish brown (10YR 4/2) foam, very dark brown (10YR 2/2) moist, weak fine granular structure soft very fnable many fine and very fine roots, neutral, clear smooth boundary
- Bw1—4 to 8 inches, dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist weak medium prismatic structure parting to weak medium subangular blocky soft friable many very fine roots, few fine accumulations of carbonate few small pebbies strong effervescence, mildly alkaline clear wavy boundary.
- Bw2 8 to 16 inches dark gray (10YR 4 1) loam, very dark brown (10YR 272) moist weak coarse prismatic structure parting to weak medium subangular blocky soft triable common very fine roots, few fine accumulations of carbonate few small pebbles, strong effervescence, mady alkaline, clear wavy boundary.
- 2Ck. 16 to 28 inches, multicolored gravelly sand; single grain loose few very line roots few time accumulations of carbonate coatings of carbonate on gravel, strong effervescence, moderately alkaline diffuse wavy boundary.
- 2C—28 to 60 inches, multicolored gravelly sand single grain loose strong effervescence moderately alkaline.

The solum ranges from 14 to 20 inches in thickness. It is neutral or mildly alkaline throughout. The depth to free carbonates ranges from 0 to 10 inches. The thickness of the mollic epipedon ranges from 10 to 18 inches.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 2 or 3. The Bw horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. Some pedons have a 8k horizon. The 2C horizon is mildly alkaline or moderately alkaline. The sand is medium or coarse, and

the gravel content ranges from 20 to more than 50 percent

#### Dorna Series

The Dorna series consists of deep, well drained soils formed in sitty material over clayey sediments. These soils are on uplands. Permeability is moderate in the sitty material and slow in the underlying sitty clay. Slopes

range from 0 to 3 percent.

Dorna soils are similar to cowry and McClure soils and commonly are near cowry and Miliboro soils. Lowry soils do not have clayey material within a depth of 40 inches. The sity mantte in the McClure soils contains slightly more clay than that in the Dorna soils. Miliboro soils are clayey throughout. They are in positions on the landscape similar to those of the Dorna soils.

Typical pedon of Dorna silt toam 65 feet north and 1 630 feet wast of the southeast corner of sec. 10, 7

105 N R 71 W

Ap=0 to 5 inches grayish brown (10YR 5/2) silt loam very dark grayish brown (10YR 3/2) moist weak medium subangular blocky structure parting to weak fine granular soft, very frable neutral abrupt smooth boundary.

A1—5 to 10 inches grayish brown (10YR 5/2) sit loam, very dark grayish brown (10YR 3/2) moist liveak coarse prismatic structure parting to weak coarse subangular blocky is ightly hard, very friable, neutral,

clear wavy boundary

A2—10 to 17 inches grayish brown (10YR 5-2) sift loam, very dark grayish brown (10YR 3-2) moist, weak coarse prismatic structure parting to weak coarse subangular blocky slightly hard very triable, slight effervescence, mildly alkaline gradual wavy boundary.

C1—17 to 23 inches, brown (10YR 5/3) sit loam, dark grayish brown (10YR 4/2) moist weak coarse subangular blocky structure slightly hard very friable strong effervescence moderately alkaline

clear smooth boundary

C2 ·23 to 27 inches grayish brown (10YR 5/2) silt loam dark grayish brown (10YR 4/2) moist weak coarse subangular blocky structure slightly hard, very friable few fine accumulations of carbonate, strong effervescence moderately alkaline clear smooth boundary.

2Ck—27 to 34 inches grayish brown (2.5Y 5/2) sity clay loam dark grayish brown (2.5Y 4.2) moist weak medium subangular blocky structure hard, fnable slightly sticky and slightly plastic many medium accumulations of carbonate strong effervescence; moderately alkaline, gradual wavy boundary

2C'1—34 to 48 nches grayish brown (2.5Y 5-2) sity clay dark grayish brown (2.5Y 4/2) moist massive, very hard I m. sticky and plastic few fragments of shale, few fine roots, common medium. accumulations of carbonate strong effervescence, moderately a kaline gradual wavy boundary

2C 2: 48 to 55 inches light brownish gray (2 5Y 6/2) sity day dark grayish brown (2 5Y 4 2) moist, massive very hard firm, sticky and plastic few line and medium accumulations of carbonate strong effervescence, moderately alkaline gradual wavy boundary.

2C 3: 55 to 60 inches give (5Y 5/3) sity clay dark grayish brown (2 5Y 4-2) moist massive very hard. Tim sticky and plastic law fine accumulations of sails, strong effervescence moderately aika ne

The depth to the clayey material ranges from 20 to 40 inches. Free carbonates are within a depth of 10 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2 it is neutral or mildly a kalme. The C horizon has value of 5 (4 moist) and chroma of 2 or 3. The 2C horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3. It is sifty clay clay or sifty clay loam that has a clay content of more than 35 percent. The C and 2C horizons are mildly alkaline or moderately alkaline.

#### **Durratein Series**

The Duristein series consists of deep ipoorly drained soils formed in diayey alluvium on flood prains. Permeability is slow. Stopes are less than 1 percent.

Ourrstein soils commonly are near Egas soils. The nearby Egas soils do not have a natric horizon and are shallower to visible saits than the Durrstein soils. They are in positions on the landscape similar to those of the Durrstein soils.

Typical pedon of Durrstein sit loam, 2,430 feet west and 75 feet north of the southeast corner of sec. 23, T. 104 N., Fl. 70 W

6 to 1 inch gray (10YR 6/1) silt loam, very dark gray (10YR 3/1) moist weak thin platy structure parting to weak fine granular slightly hard fnable; many fine roots, slightly acid; abrupt smooth boundary

Bt1—1 to 4 inches, dark gray (10YR 4/1) sitty clay, very dark gray (10YR 3/1) moist; gray (10YR 6/1) coatings on the tops of columns; weak medium and coarse columns structure parting to moderate medium subangular blocky very hard very firm sticky and plastic few fine flat roots, mildly alkaline; clear smooth boundary.

Bt2—4 to 7 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist weak coarse prismatic structure parting to moderate medium subangular blocky, hard, very firm, sticky and plastic, lew fine flat roots; strongly alkaline; clear wavy boundary

BCkz—7 to 19 inches, gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist, weak coarse prismatic structure parting to weak medium and coarse

subangular blocky very hard, very firm, sticky and plastic, lew fine roots, common fine nests of sails, tew fine accumulations of carbonate, strong effervescence, strongly alkaline, clear wavy boundary.

Clag—19 to 40 inches, gray (5Y 5/1) sity clay, very dark gray (5Y 3/1) moist; massive; very hard, firm, sticky and plastic few line roots, common line nests of saits, few line accumulations of carbonate strong effervescence, very strongly alkakine, gradual wavy boundary.

Cg—40 to 60 inches gray (5Y 5/1) sifty clay very dark gray (5Y 3/1) moist, massive very hard firm, shoky and plastic few fine roots common fine nests of salts common coarse nests of gypsum few fine accumulations of carbonate strong effervescence, strongly alkaine

The thickness of the solum ranges from 10 to 25 inches. The depth to accumulations of salts ranges from 5 to 15 inches.

The E horizon has value of 5 or 6 (3 or 4 moist) and chroma of 1 or 2 It is slightly acid or neutral. The Bt horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is clay or silty clay. It ranges from neutral to strongly alkaline. The C horizon has hue of 2.5Y or 5Y value of 5 or 6 (3 or 4 moist), and chroma of 1 or 2. It is silty clay clay loam, or silty clay loam. It ranges from moderately alkaline to very strongly alkaline. Some pedons have few to many, fine or medium, faint to prominent mothes in the BC and C horizons.

#### Eakin Series

The Eakin series consists of deep, well drained soils formed in silty material over day loam glacial till. These soils are on uplands. Permeability is moderate in the subsoil and moderately slow in the underlying material. Slopes range from 0 to 3 percent.

Eakin soils are similar to Grenham and Highmore soils and commonly are near DeGrey. Highmore: Jerauid, and Mobridge soils. DeGrey and Jerauid soils have a natric horizon. They are in small pits and depressions. Grenham soils contain more sand and less set in the subsoil than the Eakin soils. Highmore soils have glacial till below a depth of 40 inches. The moderately well drained Mobridge soils are in swales.

Typica pedon of Eakin silt loam in an area of Eakin-DeGrey silt loams. 0 to 3 percent slopes, 80 feet west and 400 feet north of the southeast corner of sec. 23, T 102 N., R. 67 W.

Ap=0 to 7 inches trank grayish brown (10YR 4/2) silt loam very dark brown (10YR 2/2) moist, weak coarse subangular blocky structure parting to weak fine granular, soft, very friable, neutral, clear smooth boundary.

8t1—7 to 13 inches, dark grayish brown (10YR 4/2) sity clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky hard, friable, sticky and plastic neutral, clear smooth boundary.

8t2—13 to 18 inches, grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) most moderate coarse prismatic structure parting to moderate medium subangular blocky, hard, friable sticky and plastic neutral clear smooth boundary.

BCk—18 to 36 inches, light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; few fine faint yellowish brown (10YR 5/6) mottles, weak coarse prismatic structure parting to weak medium subangular blocky; hard, very friable slightly sticky and siightly plastic common fine and medium accumulations of carbonate; strong effervescence moderately alkaline; gradual irregular boundary

2Ck—36 to 46 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine prominent yellowish red (5YR 5/8) and brown (7.5YR 5/2) mottles; massive; very hard, firm, sticky and plastic; common fine to coarse accumulations of carbonate strong effervescence strongly alkaline, clear wavy boundary.

2C—46 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine and medium prominent yellowish red (5YR 5/8), light brownish gray (2.5Y 6/2), and brown (7.5YR 5.2) motties, massive very hard, firm sticky and plastic few fine accumulations of carbonate, strong effervescence, strongly alkaline.

The thickness of the solum ranges from 20 to 38 inches. The thickness of the mollic epipedon ranges from 9 to 20 inches. The depth to free carbonates ranges from 10 to 18 inches. The depth to loam or clay loam glacial till ranges from 20 to 40 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The BI horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. The 2C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It is foam or day foam glacial till. It ranges from mildly alkaline to strongly alkaline.

## **Egas Series**

The Egas series consists of deep, poorly drained soils formed in alluvium on flood plains. Permeability is slow. Slopes are less than 1 percent.

Egas soils commonly are near Betts Durrstein Egas Variant, and Java soils. The well drained Betts and Java soils are in positions on the landscape similar to those of the Egas soils. Durrstein soils have a natric horizon. Egas Variant soils have a calcic horizon.

Typical pedon of Eqas silty clay loam 1 690 feet east and 505 feet north of the southwest corner of sec. 24. T 107 N , R 68 W

- A1—0 to 1 inchi gray (10YR 5/1) sity day loam very dark brown (10YR 2/2) moist, weak tine granular structure slightly hard, firm slightly sticky and slightly plastic common fine roots mildly alkaline, abrupt smooth boundary.
- A2—1 to 5 nches dark gray (10YR 4/1) sitly clay very dark gray (10YR 3/1) moist weak medium subangular blocky structure very hard very firm sticky and plastic few line accumulations of saits and gypsum, common fine roots imoderately alkaline clear wavy boundary.
- ACzg—5 to 13 inches dark gray (5Y 4/1) sitly clay very dark gray (5Y 3/1) moist, weak coarse subangular blocky structure very hard very firm slicky and ptastic many line and medium accumulations of sails, common fine roots, strong effervescence, strongly alkaline; gradual wavy boundary.
- Czg1 13 to 20 nches gray (5Y 5 1) sity clay dark gray (5Y 4/1) moist massive very hard very lirm, sticky and plastic common line and medium accumulations of gypsum and other salts few fine roots strong effervescence strongly alkaline gradual wavy boundary.
- Czg2—20 to 33 inches gray (5Y 6/1) sitty clay plive gray (5Y 4/2) moist massive very hard, very firm slightly sticky and plastic few fine roots common fine and medium accumulations of gypsum and other saits strong effervescence strongly alkaline, gradual wavy boundary.
- Cg1 33 to 58 inches, gray (5Y 6/1) ctay loam olive gray (5Y 4/2) moist common line faint light olive brown (2 5Y 5/6) mothes, massive very hard firm slightly sticky and plastic, few line roots common fine accumulations of gypsum and other saits strong effervescence, strongly alkaline, gradual wavy boundary.
- Cg2 -58 to 60 inches light gray (5Y 7/1) sitty clay dark gray (5Y 4/1) moist common fine faint light olive brown (2.5Y 5/6) mottles massive very hard very firm, sticky and plastic common fine accumulations of gypsum and other salts, strong effervescence, moderately alkaline.

The thickness of the molic epipedon ranges from 8 to 24 inches. The depth to accumulations of salts remains from 0 to 7 inches. Carbonates are within a depth of 10 inches.

The A1 horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The AC horizon has value of 4 or 5 (2 to 4 moist) and chroma of 1 or 2. It is sity clay loam or sity clay. The C horizon has value of 5 to 7 (4 or 5 moist) and chroma of 1 or 2. It is stratified sity clay sity clay loam, and clay loam.

### Egas Variant

The Egas Vanant consists of deep very poorly drained soils formed in alluvium on flood plains. Permeability is allow. Slopes are less than 1 percent.

Egas Variant soils commonly are near Durrstein Egas, and Schamber soils. Durrstein and Egas soils are sightly higher on the flood plains than the Egas Variant soils. Durrstein soils have a natric horizon. Egas soils do not have a carcic horizon. Schamber soils have gravelly material within a depth of 10 inches. They are on ridges and terrace scarps.

Typical pedon of Egas Variant sity clay loam, 60 feet north and 1,800 feet west of the southeast corner of sec. 4, T 107 N., R 68 W

- A1—0 to 4 inches, dark gray (10YR 4/1) sity clay loam, very dark gray (10YR 3/1) morst weak fine and medium subangular blocky structure; slightly hard, friable common line roots, mildly alkaune, clear wavy boundary.
- A2—4 to 10 inches gray (10YR 5/1) sitty clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure slightly hard, friable, common fine roots, strong effervescence, moderately alkaline, clear wavy boundary.
- ACk—10 to 20 inches, grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist, weak medium subangular blocky structure, slightly hard friable sticky and slightly plastic few fine roots many fine and few medium accumulations of carbonate violent effervescence moderately a kaine, gradual wavy boundary.
- Ckg1—20 to 50 inches gray (5Y 6-1) silty clay loam, olive gray (5Y 4-2) moist massive slightly hard, friable sticky and slightly plastic few fine roots, few fine accumulations of salts, common fine to coarse accumulations of carbonate, violent affarvescence; moderately atkatine; gradual wavy boundary.
- Ckg2—50 to 80 inches, gray (5Y 6/1) sifty day loam, olive gray (5Y 4+2) morst massive very hard, firm, sticky and plastic lew fine roots few fine accumulations of salts; few fine black (10YR 2/1) concretions of iron and manganese oxide; few fine accumulations of carbonate strong effervescence; mildly alkaline

The thickness of the solum ranges from 10 to 25 inches. Free carbonates are within a depth of 5 inches. The thickness of the molic epipedon ranges from 7 to 20 inches.

The A horizon has hue of 10YR or 2.5Y value of 4 or 5 (2 or 3 moist), and chrome of 1 or 2. It is mildly alkaline or moderately alkaline. The ACk horizon has hue of 10YR or 2.5Y value of 4 or 5 (2 to 4 moist) and chrome of 1 or 2. It ranges from mildly alkaline to strongly alkaline. It is sitty clay lipam or sity clay. The C.

horizon has hue of 10YR to 5Y value of 5 to 7 (4 or 5 moist), and chroma of 1 or 2 it ranges from mildly a kaline to strongly alkaline. It is sifty clay sifty clay loam, or clay loam. Thin strata of coarser textured material are between depths of 40 and 60 inches in some pedons.

#### Farmsworth Series

The Farmsworth series consists of deep somewhat poorly drained soils formed in clayey and sitty glaciolacustrine sediments on flood plains. Permeability is slow or very slow. Slopes are 0 to 2 percent.

Farmsworth soils are similar to Cavo and DeGrey soils and commonly are near Bon Duristein. Egas, and Lane soils. The moderately well drained Bon and Lane soils do not have a natric horizon. They are slightly higher on the flood plains than the Farmsworth soils. Cavo and DeGrey soils are dark to a depth of less than 20 inches. The poorty drained Duristein and Egas soils are on the lower parts of the flood plains.

Typical pedon of Farmsworth sitt loam, in Plant of Lane-Farmsworth sitt loams, 350 leet east and 2,560 feet south of the northwest corner of sec. 4, T. 104 N., P. 67 W.

A=0 to 5 inches, gray (10YR 5/1) sit loam, very dark gray (10YR 3/1) moist weak thin platy structure parting to weak fine granular soft, very friable many very fine roots slightly acid clear smooth boundary.

E—5 to 8 inches, light gray (10YR 6/1) silt loam, very dark gray (10YR 3/1) moist, moderate thin platy structure; soft very triable common very fine roots, slightly acid; abrupt smooth boundary.

Bt1—8 to 10 inches, dark gray (10YR 4/1) sity clay, black (10YR 2 1) moist imoderate medium and coarse columnar structure, hard very firm very sticky and very plastic, few very fine roots light gray (10YR 6/1) coatings on the tops and sides of columns ineutral clear smooth boundary.

Bt2—10 to 18 inches, dark gray (10YR 4/1) silty clay back (10YR 2/1) moist moderate medium and coarse prismatic structure parting to moderate medium and coarse subangular blocky, very hard, very firm, very sticky and very plastic, few very fine roots, light gray (10YR 6/1) coatings on the sides of prisms, mildly atkaline, clear wavy boundary.

Bt3—18 to 26 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist, few light gray (10YR 6/1) coatings on the sides of prisms, moderate medium and coarse prismatic structure parting to moderate medium and coarse subangular blocky very hard, very firm very sticky and very plastic few very fine roots, very few fine accumulations of carbonate, few fine and medium accumulations of safts; mildly alkaline, clear wavy boundary.

8Ckz—26 to 39 inches; dark grayish brown (10YR 4/2) sity clay, very dark gray (10YR 3/1) moist; weak medium and coarse prismatic structure parting to weak medium and coarse subangular blocky, very hard very firm very sticky and very plastic few very fine roots common medium and coarse accumulations of carbonate many fine and medium accumulations of saits, strong effervescence, mildly alkaline, gradual wavy boundary

Ck 39 to 46 inches grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) sifty clay loam, very dark grayish brown (2.5Y 3/2) moist, common fine distinct brownish yellow (10YR 6/6) mottles, massive hard firm, sticky and plastic, few very fine roots many fine and medium accumulations of carbonate few fine accumulations of salts, strong effervescence, moderately alkaline, clear wavy boundary.

Cg—46 to 60 inches light brownsh gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; common fine distinct light gray (N 7/0) and many fine and medium distinct brownish yellow (10YR 6/6) mottles; massive; hard, fnable, slightly sticky; common fine accumulations of carbonate, strong effervescence; madly alkaline.

The thickness of the solum and of the mollic epipedon ranges from 20 to 40 inches. The depth to free carbonates ranges from 10 to 30 inches.

The A honzon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is sightly acid or neutral. The E honzon has value of 5 or 6 (3 or 4 moist) and chroma of 1 or 2. The BI honzon has value of 3 to 5 (2 or 3 moist) and chroma of 1. It averages as low as 45 percent clay in some pedons and as high as 60 percent clay in others. It ranges from neutral to mildly alkalina. The C honzon has hue of 2.5Y or 5Y, value of 5 or 6 (3 to 5 moist), and chroma of 1 or 2.

## Gettys Series

The Gettys series consists of deep well drained soils formed in firm, loamy and clayey glacial till on uplands. Permeability is moderately slow. Slopes range from 9 to 40 percent.

Gettys axis are similar to Betts exils and commonly are near Betts, Sansarc, Schamber, and Sully soils. Betts soils contain less clay throughout than the Gettys soils. Sansarc soils are 4 to 20 inches deep over shale. They are sightly lower on the landscape than the Gettys soils. Schamber and Sully soils are in positions on the landscape similar to those of the Gettys soils. Schamber soils are undertain by gravelly material within a depth of 10 inches. The silty Sully soils formed in losss.

Typical pedon of Gettys clay foam 25 to 40 percent slopes, 100 feet east and 530 feet south of the northwest corner of sec. 8, T. 103 N, R. 71 W.

A-0 to 2 inches grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) and dark grayish

brown (2.5Y 4/2) moist; weak fine granular. structure; slightly hard, fnable, slightly sticky and slightly plastic; many fine roots; few pebbles; strong effervescence moderately alkaline clear smooth

boundary

AC-2 to 8 inches; gravish brown (2 5Y 5/2) clay loam, dark gravish brown (2.5Y 4/2) most; lew fine distinct brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure, slightly hard. fnable, sightly sticky and slightly plastic; many line roots, lew pebbies, lew fine and medium accumulations of carbonate strong effervescence. moderately alkaline; gradual wavy boundary.

Ck-8 to 24 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist, common fine distinct brownish yellow (10YR 6/8) mottles, weak medium subangular blocky structure hard, firm, sticky and plastic; few fine roots; few pebbles. common medium accumulations of carbonate strong effervescence; moderately alkaline; gradual

wavy boundary.

C1-24 to 30 inches, light brownish gray (2 5Y 6/2) clay loam dark grayish brown (2.5Y 4/2) moist, common fine distinct olive yellow (2.5Y 6/8) mottles; hard, firm, sticky and plastic; few fine roots; few pebbles; few fragments of shale; few fine accumulations of carbonate; slight effervescence; moderately alkaline,

gradual wavy boundary

C2-30 to 39 inches, light brownish gray (2.5Y 6/2) day loam, dark grayish brown (2.5Y 4/2) moist, common fine distinct clive vellow (2.5Y 6/8) mottles, massive; hard, firm, sticky and plastic, few peobles, few fragments of shale, few fine accumulations of carbonate and saits, slight effervescence, moderately alkaline gradual wavy boundary

C3-39 to 50 inches light brownish gray (2.5Y 6/2) clay, dark dravish brown (2.5Y 4/2) moist common fine to coarse distinct light yellowish brown (2.5Y 6/4). and dark brown (10YH 4/3) moltiles, massive; hard, firm, sticky and plastic few pebbles about 20 percent fragments of shale, common fine accumulations of salts, few fine accumulations of carbonate slight effervescence, moderately aticaine; diffuse wavy boundary

C4-50 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark gravish brown (2.5Y 4/2) moist, common fine to coarse faint light yellowish brown (2.5Y 6/4) and distinct dark brown (10YR 4/3) mottles, massive, hard, firm, sticky and plastic, common fine accumulations of sails, few pebbles, few fragments of shale; slight effervescence, moderately alkaline

Free carbonates are at the surface or within a few inches of it. The control section everages as low as 35 percent clay in some pedons and as high as 50 percent. clay in others. Few or common pebbies and cobbles are throughout the profile in most pedons.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 to 4 moist) and chroma of 1 or 2. It is neutral to moderately atkaline. It dominantly is clay loam but in some pedons is learn or silt learn. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 1 to 3. It is clay loam or clay. The content of shale fragments in this horizon ranges from 5 to 25. percent.

#### Glenham Series

The Glenham senes consists of deep, well drained soits formed in loamy glacial till on uplands. Permeability is moderate in the subsoli and moderately slow in the underlying material. Slopes range from 0 to 9 percent.

Grenham soils are similar to Eakin and Ree soils and commonly are near Highmore, Java, Mobridge, and Plankinton soils. Eakin and Highmore soils contain less. sand in the subsoil than the Gienham soils. They are in positions on the landscape similar to those of the Grenham sorts Java sorts have free carbonates within a depth of 10 inches. They are on convex slopes, knots, and ridges. The moderately well drained Mobridge soils. are in swales. The poorly drained Plankinton soits are indepressions. The underlying material in the Ree soils is strathed.

Typical pedon of Glenham loam, in an area of Glenham-Java loams, 3 to 6 percent slopes, 245 feet west and 745 feet north of the southeast corner of sec-19. T. 108 N. R 69 W

A-0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist, weak fine subangular blocky structure parting to weak line granular soft very fnable many fine roots, neutral, clear smooth boundary

Bt1-4 to 7 inches, dark grayish brown (10YR 4/2) clay loam, dark brown (10YR 3-3) moist, moderate medium prismatic structure parting to moderate medium and fine subangular blocky hard friable sagnity sticky and slightly plastic, common fine roots,

neutral, clear amooth boundary

8t2-7 to 11 inches; brown (10YR 5/3) clay Joam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky hard fnable slightly sticky and slightly plastic, common fine roots, shiny surfaces on peds neutral clear wavy boundary

BCk--11 to 16 inches, light brownish gray (10YR 6-2) clay loam, dark brown (10YR 4/3) and dark grayish. brown (10YR 4/2) moist, weak medium prismatic structure parting to moderate medium and fine subangular blocky hard, friable, slightly sticky and saightly plastic common fine roots common fine and medium accumulations of carbonate, strong effervescence mildly alkaline gradual wayy boundary

Ck—16 to 28 inches, light brownish gray (10YR 6/2) clay loam dark grayish brown (10YR 4/2) moist weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; lew fine roots, common fine and medium accumulations of carbonate; mildly alkaline; diffuse wavy boundary

C—28 to 60 inches light brownish gray (10YR 6-2) day loam, dark grayish brown (10YR 4/2) moist; massive hard, friable slightly sticky and slightly plastic lew fine strong brown (7-5YR 5/6) accumulations of iron and manganese oxide: few fine accumulations of carbonate moderately alkaline.

The thickness of the solum ranges from 14 to 28 inches. The depth to free carbonates ranges from 10 to 14 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2 it dominantly is loam but in some pedons is 5, to am. The Bt horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It averages as low as 25 percent clay in some pedons and as high as 35 percent clay in others. The C horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 to 4.

## **Highmore Series**

The Highmore senes consists of deep, well drained soils formed in sitty material on uplands. Permeability is moderate. Slopes range from 0 to 9 percent.

Highmore soils are similar to Eakin and Uly soils and commonly are near DeGrey Eakin Java, Mobridge and Plankinton soils DeGrey soils have a natric horizon. They are in small depressions Eakin soils are 20 to 40 inches deep over loamy glacia. It is Java soils contain more sand than the Highmore soils and are not so deep to free carbonates. They are on ridges and knotts. The moderately well drained Mobridge soils are in swales. The poorly drained Plankinton soils are in depressions. Uly soils do not have an arguic horizon.

Typical pedon of Highmore silt loam, in an area of Highmore-Mobridge silt loams, B to 4 percent slopes, 140 feet north and 1 585 feet west of the southeast corner of sec. 2, T, 103 N, R, 69 W.

Ap. 0 to 6 inches, dark grayish brown (10YR 4/2) sift toam very dark grayish brown (10YR 3/2) moist weak fine and medium subangular blocky structure parting to weak fine granular soft, very fnable, neutral; abrupt smooth boundary

Bit —6 to 17 inches brown (10YR 4-3) skty ctay loam, dark brown (10YR 3/3) moist, weak medium and coarse prismatic structure parting to moderate medium subangular blocky hard, fnable slightly sticky and slightly plastic shiny surfaces on peds, mildly alkakne; clear wavy boundary.

Bt2—17 to 21 inches; brown (10YR 5-3) sity clay loam. dark brown (10YR 4/3) moist; weak medium and

coarse prismatic structure parting to moderate medium subangular blocky hard friable slightly sticky and slightly plastic shiny surfaces on pedsimildly alkaline labrupt wavy boundary.

BCk 21 to 26 inches light brownish gray (2.5Y 6/2) silty ctay loam dark grayish brown (2.5Y 4/2) moist, weak medium and coarse prismatic structure parting to moderate medium subangular blocky hard thable slightly sticky and slightly plastic common fine and medium accumulations of carbonate strong effervescence moderately alkaline gradual wavy boundary.

Ckt -26 to 38 inches pale yellow (2.5Y 7/4) set loam. olive brown (2.5Y 4/4) moist; few fine faint brownish yellow (10YR 6/6) mothes massive slightly hard, fnable common medium and coarse accumulations of carbonate strong effervescence moderately alkaline clear wavy boundary.

Ck2—38 to 46 inches, light yellowish brown (2.5Y 6/4) sitt loam, pilve brown (2.5Y 4/4) and grayish brown (2.5Y 5/2) moist; many fine and medium distinct yellowish brown (10YR 5/8) and light gray (10YR 7/1) mottles; massive; soft, very friable; common medium accumulations of carbonate; strong effervescence, moderately alkaline; clear wavy boundary.

C—48 to 60 inches, tight gray (2.5Y 7/2) allt loam, grayish brown (2.5Y 5/2) moist; many fine to coarse prominent strong brown (7.5YR 5/8) mottles, massive soft very frable law fine and medium accumulations of carbonate strong effervescence moderately alkaline.

The thickness of the solum ranges from 20 to 36 inches. The thickness of the mollic epipedon ranges from 9 to 20 inches. The depth to free carbonates ranges from 12 to 24 inches.

The Ap horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid or neutral. The Bt horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It averages as low as 27 percent diay in some pedons and as high as 35 percent diay in others. It is neutral or middly alkaline. The C horizon has value of 5 to 7 (4 or 5 moist) and chroma of 2 to 4. It is middly alkaline or moderately alkaline. It is slifty diay loam, silt loam, or very fine sandy loam.

## **Hurley Series**

The Hurley series consists of moderately deep, well drained soils that formed in clayey shale residuum on uplands. Permeability is very slow. Slopes range from 0 to 6 percent.

Hurley soils are similar to Carter and Jerauld soils and commonly are near Bullcreek, Opal, Promise, and Sansarc soils. Bullcreek and Promise soils are in positions on the landscape similar to those of the Hurley.

soils. They do not have a natic horizon. Carter and uerauid soils do not have shale within a depth of 40 inches. Opal soils and the shallow Sansarc soils do not have a natric horizon. They are higher on the landscape than the Hurley soils.

Typical pedon of Hurley silt loam 0 to 6 percent alopes 310 feet west and 2 380 feet south of the northeast corner of sec. 20 T. 106 N., P. 69 W.

E=0 to 2 inches light brownish gray (10YR 6/2) silt loam, very dark gray shibrown (10YR 3-2) moist, weak thin platy structure parting to weak fine granular soft very friable common line roots, neutral, abrupt smooth boundary.

8t1—2 to 4 inches, dark grayish brown (10YR 4/2) clay very dark grayish brown (10YR 3/2) moist, moderate medium and coarse columnar structure very hard, very firm sucky and plastic few fine list roots, moderately alkaline abrupt smooth boundary.

Bt2 4 to 8 inches, dark grayish brown (10YR 4-2) clay very dark grayish brown (10YR 3-2) moist, weak coarse prismatic structure parting to moderate line and medium subangular blocky very hard very firm, sticky and plastic, few line flat roots moderately askaline abrupt wavy boundary.

BCkz—8 to 14 inches, dark grayish brown (2.5Y 4/2) clay very dark grayish brown (2.5Y 3/2) moist, weak coarse prismatic structure parting to moderate fine and medium subangular blocky very hard very firm, sticky and plastic few fine flat roots common fine accumulations of saits and carbonate strong effervescence moderately alkaline clear wavy

boundary

Ckz—14 to 21 inches grayish brown {2.5Y 5/2} and light brownish gray (2.5Y 6/2) clay dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5.2) moist massive very hard, very firm, sticky and plastic few fine fiat roots, common fine accumulations of salts, common fine and medium accumulations of carbonate and gypsum, strong effervescence, moderately a kaline, gradual wavy boundary.

Cz—21 to 30 inches, light brownish gray (2.5Y 6/2) and grayish brown (2.5Y 5/2) shaly diay grayish brown (2.5Y 5/2) and dark grayish brown (2.5Y 4/2) moist, massive; very hard, very firm, sticky and plastic; few fine stains, yellowish brown (10YR 5/6) moist, common fine accumulations of saits, few fine accumulations of carbonate many fine and medium accumulations of gypsum, strong effervescence, moderately alkame gradual wavy boundary.

Cr—30 to 60 inches; light gray (2.5Y 7/2) and dive yellow (2.5Y 6/6) shale, grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) moist, common fine and medium nests of gypsum and other salts, strong effervescence; moderately alkaline

The depth to free carbonates ranges from 4 to 12 inches. The depth to shale ranges from 20 to 40 inches.

The E horizon has hue of 10YR or 25Y, value of 4 to 6 (3 or 4 moist), and chroma of 1 or 2. The 8t horizon has hue of 10YR or 25Y, value of 4 or 5 (3 or 4 moist), and chroma of 1 or 2. It averages as low as 60 percent clay in some periods and as high as 70 percent clay in others it is mildly alkaline or moderately alkaline. The C horizon has value of 5 or 6 (4 or 5 moist) and chroma of 1 or 2. It ranges from mildly alkaline to strongly alkaline. The Cr horizon ranges from slightly acid to moderately alkaline.

#### Java Series

The Java series consists of deep, well drained soils formed in loamy glacial till on uplands. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Slopes range from 2 to 25 percent.

Java soils are similar to Betts soils and commonly are near Betts, Glenham, Highmore, and Mobridge soils. Betts soils do not have a mollic epipedon. Glenham and Highmore soils have an argicia horizon. They are on the tess sloping parts of the landscape. The moderately well drained Mobridge soils are in swales.

Typical pedon of Java loam, in an area of Java-Betts loams, 8 to 20 percent slopes, 310 feet west and 330 feet south of the northeast corner of sec. 28, T. 106 N , R. 68 W.

A—0 to 4 inches, dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure parting to weak fine granular slightly hard very friable common very fine roots slight effervescence, neutral, clear wavy boundary.

Bw—4 to 8 inches, dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to weak medium subangular blocky slightly hard fnable common very fine roots, strong aftervescence, mildly alkaline, gradual wavy boundary.

BCk—8 to 18 inches pale brown (10YR 6/3) loam brown (10YR 5/3) moist, weak coarse prismatic structure parting to weak medium subangular blocky; hard friable common very fine roots common medium accumulations of carbonate strong effervescence, moderately alkaline, gradual wavy boundary.

Ck1—18 to 24 inches pale brown (10YR 6/3) loam, olive brown (2 5Y 4/4) moist; weak medium and coarse subangular blocky structure hard friable slightly sticky and slightly plastic few very fine roots, common medium accumulations of carbonate and saits, strong effervescence moderately alkaline, drifuse wavy boundary.

Ck2--24 to 35 inches, light yellowish brown (2.5Y 6/4) loam, give brown (2.5Y 4/4) moist, few fine distinct

strong brown (7.5YR 578) and light gray (N.270) mottles massive hard fnable slightly sticky and slightly plastic few very fine roots, few medium and coarse accumulations of carbonate strong effervescence moderately alkaline, gradual wavy boundary.

C1 35 to 45 inches light yellowish brown (2.5Y 6/4) loam dark grayish brown (2.5Y 4/2) moist few fine distinct light gray (N.770) strong brown (7.5YR 5/8), and reddish yellow (7.5YR 6/6) mottles massive hard frable slightly sticky and slightly plastic few very fine roots few fragments of shale few tine accumulations of carbonate strong effervescence; moderately alkaline diffuse wavy boundary.

C2—45 to 60 inches hight yellowish brown (2.5Y 6-4) clay loam, dark grayish brown (2.5Y 4-2) moist massive hard firm sticky and plastic common fine distinct reddish yellow (7.5YR 6-6) and dark reddish gray (5YR 4-2) stains strong effervescence, moderately alkaline

The depth to free carbonates is less than 10 inches. The thickness of the solum ranges from 15 to 20 inches. The control section averages as low as 18 percent clay in some pedons and as high as 30 percent clay in others.

The A horizon has value of 4 (2 or 3 moist) and chroma of 2. The Bw horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2 or 3. It is loam or clay loam. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It is clay loam or loam.

#### Jerauld Series

The Jerauld senes consists of deep somewhat poorly drained soils formed in loamy gracial till on uplands. Permeability is slow. Slopes range from 0 to 5 percent upravid soils are similar to Carter and Hurley soils and commonly are near Beadle. DeGrey Eakin, and Highmore soils. Beadle. Eakin, and Highmore soils do not have a natric horizon. They are on the high parts of the fandscape. Carter and Hurley soils contain more clay in the subsoil than the Jerauld soils. DeGrey soils are deeper to visible salts than the Jerauld soils. Also, they are slightly higher on the landscape.

Typical pedon of Jerauid sit loam, in an area of Beadle-Jerauld complex 1 to 5 percent slopes 180 feet south and 740 feet east of the northwest corner of sec. 17, T 108 N R 69 W

- E=0 to 2 inches grayish brown (10YR 5/2) silt loam very dark gray (10YR 3/1) moist, weak thin platy structure soft friable many fine roots, medium acid, abrupt smooth boundary.
- 8t1—2 to 4 inches, dark grayish brown (10YR 4/2) ctay loam black (10YR 2/1) moist moderate medium columnar structure parting to strong fine blocky very hard, very firm, sticky and plastic, few very fine flat.

roots, thin continuous gray (10YR 6/1) coatings on the tops of columns, neutral, clear wavy boundary

- Bt2—4 to 9 inches dark gray (10YR 4/1) clay loam very dark gray (10YR 3/1) moist moderate medium prismatic structure parting to strong fine and medium blocky very hard firm sticky and plastic few very fine flat roots, mildly alkaline clear wavy boundary.
- BCkz =9 to 14 nches grayish brown (2.5Y 5-2) clay loam dark grayish brown (2.5Y 4-2) moist moderate medium prismatic structure parting to moderate fine and medium subangular blocky very hard firm, sticky and plastic few very tine flat roots few fine and medium nests of gypsum and salts, few fine accumulations of carbonate strong effervescence mildly alaktine gradual wavy boundary.
- Ckz1—14 to 29 inches, grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4.2) moist weak fine and medium subangular blocky structure hard, firm slightly sticky and slightly plastic common medium and fine nests of gypsum and saits, common medium accumulations of carbonate violent effervescence, mildly alkaline, gradual wavy boundary.
- Ckz2—29 to 40 inches light brownish gray (2.5Y 6-2) ctay paim dark grayish brown (2.5Y 4.2) moist few fine prominent strong brown (7.5YR 5-8) moittles, common fine and medium prominent very dark brown (10YR 2.2) manganese stains massive hard, firm slightly sticky and slightly plastic common medium nests of gypsum and saits common medium accumulations of carbonate strong effervescence, moderately alkaline gradual wavy boundary.
- C—40 to 60 inches light brownish gray (2.5Y 6/2) and light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist, common line faint light olive brown (2.5Y 5/4) and few line prominent ye lowish red (5YR 4/6) mothes massive slightly hard, friable, slightly slicky and slightly plastic, few line accumulations of carbonate, strong effervescence moderately alicaline.

The thickness of the solum ranges from 10 to 20 inches. The depth to free carbonales ranges from 6 to 12 inches. Some pedons have an A horizon, which is 1 to 2 inches thick.

The £ horizon has value of 5 to 7 (3 to 5 moist) and chroma of 1 or 2. It ranges from medium acid to neutra. The 81 horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is clay loam, clay or sifty clay it ranges from neutral to moderately askaline. The C horizon has hoe of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 1 to 4. It is sifty clay loam, clay loam, sifty clay or clay it ranges from middly askaline to strongly alkaline.

#### Kolls Series

The Kolls series consists of deep, poorly drained soils formed in clayey sediments in depressions in the uplands. Permeability is very slow. Slopes are less than 1 percent.

Kolls soils are similar to Plankinton and Worthing soils and commonly are near Promise soils. Plankinton soils contain less clay in the subsoil than the Kolls soils. The well drained Promise soils are higher on the landscape than the Kolls soils. Worthing soils are more than 35 miches deep to free carbonates.

Typical pedon of Kolts sifty clay, 55 feet west and 1,400 feet south of the northeast corner of sec. 28, T.

106 N., R. 69 W

A=0 to 2 inches, gray (10YR 5/1) sitty clay, vary dark gray (10YR 3/1) moist, weak fine granular structure; hard, firm, sticky and plastic; common fine roots, slight effervescence; moderately alkaline; clear

smooth boundary

Bw—2 to 10 inches; gray (10YR 5/1) clay, very dark gray (10YR 3/1) moist; few fine reddish yellow (7 5YR 6/8) moitles; moderate coarse prismatic structure parting to weak coarse and medium blocky; extremely hard, very firm, sticky and plastic; common fine roots; common pressure faces, strong effervescence; moderately alkaline; gradual irregular boundary.

Bg—10 to 17 inches; gray (SY 5/1) clay, very dark gray (SY 3/1) crushing to dark gray (SY 4/1) most; few fine reddish yellow (7.5YR 6/8) mottles; moderate medium and coarse prismatic structure parting to moderate medium and coarse blocky; extremely hard, very firm, sticky and plastic; common fine roots; common gray (10YR 5/1) tongues; common pressure faces; strong effervescence; moderately

alkaline; gradual wavy boundary

BCg—17 to 26 inches, gray (5Y 5/1) clay, very dark gray (5Y 3/1) crushing to dark gray (5Y 4/1) morst; lew fine reddish yellow (7 5YR 6/8) mottles; weak medium and coarse prismatic structure parting to weak medium and coarse blocky; extremely hard, very firm, sticky and plastic, common fine roots; strong effervescence; moderately alkaline; gradual wavy boundary.

Cg1—26 to 54 inches, gray (5Y 5/1) clay, dark gray (5Y 4/1) most; common fine to coarse reddish yellow (7 5YR 6/8) mottles; massive; extremely hard, very firm, sticky and plastic, lew fine roots, few medium accumulations of carbonate; strong effervescence, moderately alkaline; diffuse wavy boundary

Cg2—54 to 60 inches; gray (5Y 6/1) clay, olive gray (5Y 4/2) moist, common fine and few medium prominent reddish yellow (7 5YR 6/8) mottles; massive; extremely hard, very firm, sticky and plastic; few fine roots; few fine nests of gypsum; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 18 to 40 inches. The mollic epipedon is less than 30 inches thick. Free carbonates are at the surface or within a few inches of it. Reaction is mildly alkaline or moderately alkaline throughout the profile.

The A horizon has hue of 10YR or 2 5Y or is neutral in hue. It has value of 4 or 5 (2 or 3 moist) and chroma of 0 or 1. The B horizon has hue of 10YR, 2 5Y, or 5Y or is neutral in hue. It has value of 4 or 5 (2 to 4 moist) and chroma of 0 or 1. The C horizon has hue of 2 5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 to 3, in some pedons the chroma is 3 below a depth of 40 inches.

#### Lane Series

The Lane series consists of deep, moderately well drained soils formed in clayey and silty sediments on flood plains and low terraces. Permeability is moderately slow. Slopes range from 0 to 2 percent.

Lane soits are similar to Mobridge soils and commonly are near Bon, Durrstein, Egas, and Farmsworth soils. Bon soils contain less clay throughout than the Lane soils. They are in positions on the landscape similar to those of the Lane soils. The poorly drained Durrstein and Egas soils are on the lower parts of the flood plains. Farmsworth soils have a natric horizon. They are in small depressions. Mobridge soils contain less clay in the subsoil than the Lane soils.

Typical pedon of Lane sity clay loam, 135 feet south and 1,320 feet east of the northwest corner of sec. 23. T 105 N., R. 68 W

- Ap—0 to 5 inches, dark gray (10YR 4/1) sity clay loam, black (10YR 2/1) moist, weak medium subangular blocky structure parting to weak medium and fine granular, slightly hard, very friable, slightly sticky and slightly plastic, slightly acid; abrupt smooth boundary
- A—5 to 8 inches, dark gray (10YR 4/1) silty clay loam. black (10YR 2/1) moist, weak medium subangular blocky structure parting to weak medium platy and weak medium granular, hard, friable, slightly sticky and slightly plastic; slightly acid; clear smooth boundary
- Bi1—6 to 13 inches, dark gray (10YR 4/1) sity clay loam, very dark gray (10YR 3/1) moist, moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; shiny surfaces on peds, neutral, clear smooth boundary.
- Bt2—13 to 19 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark gray (10YR 3/1) moist, weak medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; striny surfaces on peds, middy alkaline; clear wavy boundary.

- Bi3—19 to 25 inches; grayish brown (10YR 5/2) sity clay loam, very dark grayish brown (10YR 3/2) moist weak medium prismatic structure parting to moderate medium and fine subangular blocky hard firm sticky and plastic shiny surfaces on peds, few fine accumulations of carbonate skight effervescence, moderately alkakine, clear smooth boundary.
- BCk—25 to 33 inches, grayish brown (10YR 5/2) sifty clay dark grayish brown (10YR 4/2) moist, few fine faint yellowish brown (10YR 5/8) mottles, weak medium and fine subangular blocky structure hard firm, sticky and plastic; common fine and medium accumulations of carbonate strong effervescence moderately alikaline clear smooth boundary.
- Ck—33 to 41 inches, grayish brown (10YR 5/2) sitty clay loam, dark grayish brown (10YR 4/2) moist, common line faint yellowish brown (10YR 5/8) mottles, massive hard, firm sticky and plastic, common fine and medium accumulations of carbonate strong effervescence, moderately alkaline clear smooth boundary.
- C1—41 to 50 inches, grayish brown (10YR 5/2) clay dark grayish brown (2.5Y 4/2) moist, massive very hard, very firm, sticky and plastic, common fine and medium accumulations of carbonate, strong effervescence, moderately alkaline; clear smooth boundary.
- C2—50 to 60 inches, light brownish gray (10YR 6/2) c ay grayish brown (2.5Y 5/2) moist massive; hard, firm, sticky and plastic; common medium nests of gypsum common line to coarse accumulations of carbonate strong effervescence, moderately alkaline.

The thickness of the solum ranges from 26 to 54 inches. The thickness of the mollic epipedon ranges from 25 to 36 inches. The depth to free carbonates ranges from 17 to 22 inches.

The A horizon has hue of 10YA value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is siightly acid or neutral. The Bt horizon has hue of 10YA value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2. It averages as low as 35 percent clay in some pedons and as high as 50 percent clay in others, it is neutral or midty alkaline. The C horizon has hue of 10YA 2.5Y, or 5Y value of 5 or 6 (4 to 6 moist), and chroma of 2 to 4, it is midty alkaline or moderately alkaline.

## **Lowry Series**

The Lowry series consists of deep, well drained soils formed in loess on uplands. Permeability is moderate. Slopes range from 0 to 15 percent.

Lowry soils are similar to Doma, Lowry Variant, and Uly soils and commonly are near Doma, Sully, and Uly soils. Dorna soils are 20 to 40 inches deep over clayey sediments. Lowry Variant soils are 22 to 40 inches deep

over sandy material. Sully soils do not have a mollic epipedon. They are on the steeper parts of the fandscape. Uty soils contain more clay throughout than the Lowry soils.

Typical pedon of Lowry silt loam. 0 to 2 percent slopes, 135 feet north and 1 000 feet east of the southwest corner of sec. 34. T. 103 N., R. 72 W.

- Ap—0 to 7 inches, grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist, weak medium subangular blocky structure parting to weak fine granuar, soft, very fnable, neutral abrupt smooth boundary
- Bw1—7 to 11 inches, grayish brown (10YR 5/2) silt loam, dark brown (10YR 3/3) moist, weak medium prismatic structure parting to weak medium subangular blocky slightly hard, very friable, mildly alkaline, clear smooth boundary.
- Bw2 -11 to 15 inches, brown (10YR 5/3) sit loam, dark brown (10YR 3/3) moist, weak medium prismatic structure parting to weak medium subangular blocky; soft, very friable few very fine accumulations of carbonate slight effervescence; mildly askaline; gradua, wavy boundary.
- BC—15 to 20 inches, brown (10YR 5/3) silt loam, dark grayish brown (10YR 4/2) moist, weak medium prismatic structure parting to weak medium subangular blocky soft, very fnable few very fine accumulations of carbonate strong effervescence moderately alkaline gradual wavy boundary.
- Ck—20 to 34 inches paie brown (10YR 6/3) sill loam dark brown (10YR 4/3) moist, massive soft very frable few fine accumulations of carbonate strong effervescence moderately alkaline, gradual wavy boundary.
- C1—34 to 58 inches; pale brown (10YR 6/3) sit loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very fnable; few very fine accumulations of carbonate strong effervescence, moderately alkaline clear wavy boundary.
- C2—58 to 60 inches paie brown (10YR 6/3) loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very fnable; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 16 to 30 inches. The depth to free carbonates and the thickness of the movic epipedon range from 8 to 20 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2 or 3. It is neutral or mildly alkaline. The Bw horizon has value of 5 (3 moist) and chroma of 2 or 3. The C horizon has hue of 10YR or 2 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. It is sift loam, very fine sandy loam, or loam. The Bw and C horizons are mildly alkaline or moderately alkaline.

### **Lowry Variant**

The Lowry Variant consists of deep, well dreined soils formed in loess over sandy material. These soils are on high terraces along the Missouri River. Permeability is moderate in the upper part of the profile and moderately rapid in the underlying material. Slopes range from 0 to 6 percent.

Lowry Variant soils are similar to Orton soils and commonly are near Lowry and Orton soils. Lowry soils have less sand in the underlying material than the Lowry Variant soils. The content of gravel in the underlying material of the Orton soils is 20 to 60 percent.

Typical pedon of Lowry Variant sit loam, 2 to 8 percent slopes, 190 feet north and 530 feet east of the southwest corner of sec. 8, T. 107 N., R. 72 W

- Ap—0 to 7 inches, grayish brown (10YR 5/2) still loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure parting to weak fine granular; soft, very fnable; neutral, abrupt smooth boundary
- 8w—7 to 11 inches, grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist, weak medium prismatic structure parting to weak medium subangular blocky ineutral, slightly hard, very frable; mildly alkaline; gradual wavy boundary
- 9C—11 to 16 inches, brown (10YR 5/3) sit loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak medium subangutar blocky; slightly hard, very fnable; strong effervescence; moderately atkaline; clear wavy boundary
- Ck1—16 to 20 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky sightly hard, very friable; common fine accumulations of carbonate strong effervescence; moderately alkaline; clear smooth boundary
- Ck2—20 to 26 inches; light gray (2.5Y 7/2) very fine sandy foam, grayish brown (2.5Y 5/2) moist; massive; soft, very fnable; common fine accumulations of carbonate; strong effervescence; moderately alkaline; clear smooth boundary
- C1—26 to 36 inches; light gray (2.5Y 7/2) loamy very time sand, grayish brown (2.5Y 5/2) moist; massive; soft, very finable; strong effervescence; moderately alkaline; clear smooth boundary
- 2C2—36 to 55 inches; light brownish gray (2 5Y 6/2) fine sand, grayish brown (2 5Y 5/2) moist, single grain loose, strong effervescence, strongly alkaline clear smooth boundary
- 2C3—55 to 60 inches, light brownish gray (2.5Y 6/2) sand grayish brown (2.5Y 5/2) moist, single grain loose, strong effervescence, strongly alkaline

The thickness of the solum ranges from 14 to 25 inches. The depth to free carbonates and the thickness of the motilic epipedon range from 7 to 20 inches. The depth to sandy malerial ranges from 22 to 38 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2 or 3. It is neutral or middly sikaline. The Bw horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It is mildly alkaline or moderately alkaline. The C horizon has hue of 10YH or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 or 3. It is loam, very fine sandy loam, or loamy very fine sand. The Bw and C horizons are mildly alkaline or moderately alkaline. The 2C horizon has hue of 2.5Y, value of 6 or 7 (5 or 6 moist), and chroma of 2 or 3. It is moderately alkaline or strongly alkaline.

#### McClure Series

The McClure series consists of deep, well drained soils formed in silty material over clayey sediments. These soils are on uplands, Permeability is moderately slow in the upper part of the profile and slow in the underlying material. Slopes range from 2 to 11 percent.

These sons are taxadjuncts to the McClure series because they do not have an arguing horizon, which is definitive for the series. They also have carbonates closer to the surface than is definitive for the series.

McClure soils are similar to Dorna and Millboro soils and commonly are near Opal and Uty soils. Dorna soils contain less clay in the subsoil than the McClure soils. Millboro and Opal soils contain more clay in the subsoil than the McClure soils. Also, Opal soils are 20 to 40 inches deep over shale. Uty soils do not have clayey materia within a depth of 40 inches. Opal and Uty soils are in positions on the landscape similar to those of the McClure soils.

Typical pedon of McClure silt loam, 2 to 6 percent slopes, 1,650 feet north and 480 feet east of the southwest corner of sec. 20, T 108 N., R, 72 W

- A=0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, very finable, abundant fine roots; slightly acid; clear smooth boundary.
- Bw—6 to 14 inches; dark grayish brown (10YR 4/2) sitt loam, very dark grayish brown (10YR 3/2) moist, weak medium prismatic structure parting to moderate medium subangular blocky soft, finable abundant fine roots, neutral, clear wavy boundary
- Bx—14 to 22 inches, dark grayish brown (2.5Y 4/2) sity clay loam, very dark grayish brown (2.5Y 3/2) moist, weak coarse prismatic structure parting to moderate medium subangular blocky hard, thable sightly sticky and slightly plastic common fine roots common fine accumulations of carbonate; slight effervascence; mildly alkaline; clear wavy boundary

- 2BCk—22 to 29 inches, light brownish gray (2.5Y 6/2) safty clay, grayish brown (2.5Y 5/2) moist: weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic, common line roots, common line and medium accumulations of carbonate, strong effervescence; moderately alkaline; clear wavy boundary.
- 2Ck—29 to 38 inches, grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist, massive, very hard, very firm, very sticky and very plastic; few line roots, about 10 percent weathered fragments of shale; common fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary
- 2C—38 to 60 inches; grayish brown (2.5Y 5/2) sity clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, very sticky and very plastic; few fine roots, about 20 percent weathered fragments of shale; few fine accumulations of carbonate; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 15 to 30 inches. The depth to free carbonates ranges from 8 to 16 inches. The thickness of the mollic epipedon ranges from 7 to 20 inches. The depth to contrasting clayey material ranges from 20 to 30 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid or neutral. The 8 horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It is neutral or mildly alkaline. The 2C horizon has true of 2 5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. It is slitly clay or clay. It is mildly alkaline or moderately alkaline

#### Miliboro Series

The Millboro series consists of deep, well drained soils formed in clayey material on uplands. When dry, these soils are characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Permeability is slow. Slopes range from 0 to 9 percent.

Millboro soits are similar to Opal and Promise soils and commonly are near Glenham, Highmore, Java, and Okaton soils. Glenham, Highmore, and Java soils contain less clay throughout than the Millboro soils. They are in positions on the landscape similar to those of the Millboro soils. Okaton soils are 8 to 20 inches deep over shale. They are on the high parts of the landscape. Opal and Promise soils do not have an argillic horizon. Also, Opal soils are 20 to 40 inches deep over shale.

Typical pedon of Millbord silty clay loam, 2 to 6 percent slopes, 185 feet south and 2,450 feet east of the northwest corner of sec. 19, T. 101 N., R. 69 W

Ap=0 to 5 inches; dark grayish brown (2.5Y 4/2) silty clay loam, very dark gray (10YR 3/1) moist; weak

- medium and fine blocky structure parting to weak fine and very fine subangular blocky; slightly hard, fnable, slightly slicky and slightly plastic, thin granular surface mulch; neutral; abrupt smooth boundary
- 8t1—5 to 11 inches, dark grayish brown (10YR 4/2) sity clay, very dark grayish brown (2.5Y 3/2) moist; weak medium and fine blocky structure parting to weak fine and very fine subangular blocky; slightly hard, firm, slightly sticky and slightly plastic; neutral; clear wavy boundary
- Bi2—11 to 16 inches; dark grayish brown (2.5Y 4/2) silty clay, very dark grayish brown (2.5Y 3/2) moist, moderate coarse prismatic structure parting to moderate fina and very fine subangular blocky; extremely hard, very firm, sticky and plastic; common dark grayish brown (10YF 4/2) tongues; neutral; clear wavy boundary
- BCk1—16 to 26 inches, grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist, moderate coarse prismatic structure parting to moderate fine and very fine subangular blocky; extremely hard, very firm, sticky and plastic; common dark grayish brown (10YR 4/2) tongues, strong effervescence; mildly alkaline; clear wavy boundary.
- BCk2—26 to 36 inches, grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse blocky structure parting to weak fine and medium subangular blocky; extremely hard, very firm, sticky and plastic; common dark grayish brown (10YR 4/2) tongues; common pressure faces, common fine and medium accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary
- C-36 to 45 inches; light olive brown (2.5Y 5/4) sity clay, olive brown (2.5Y 4/4) moist; massive; very hard, firm, sticky and plastic, few dark grayish brown (10YR 4/2) tongues; few fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.
- Cz—45 to 60 inches, light ofive brown (2.5Y 5/4) sitty clay, olive brown (2.5Y 4/4) moist; massive, very hard, firm, slicky and plastic; common fine accumulations of salts; few fine accumulations of carbonate; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 18 to 42 inches. The depth to free carbonates ranges from 9 to 16 inches. The thickness of the mollic epipedon also ranges from 9 to 16 inches. Reaction is neutral or mildly alkaline in the A and Bt horizons and mildly alkaline or moderately alkaline in the C horizon.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. The Bt horizon has value of 4 or 5 (3 or 4 moist) and chroma of 1 to 3. The C horizon has value of 5 to 7 (4 or 5 moist) and chroma of 2 to 4.

### Mobridge Series

The Mobridge series consists of deep moderately well drained soils formed in silty all unium in swales in the uplands. Permeability is moderate. Slopes range from 0 to 3 percent.

Mobridge softs are similar to Lane sods and commonly are near Ealun, Glenham. Highmore Planiunton, and Jly soils. The well drained Eakin, Glenham, Highmore, and Uly soils have a mollic epipedon that is less than 20 inches thick. They are higher on the landscape than the Mobridge soils. Lane soils contain more clay in the subsoil than the Mobridge soils. The poorly drained Plankinton soils are in depressions.

Typical pedon of Mobridge silt loam in an area of Mobridge-Plankinton silt loams, 2 100 feet north and 730 feet west of the southeast corner of sec. 16 T. 103 N . R. 69 W.

- Ap—0 to 7 inches, very dark grayish brown (10YR 3/2) sitt loam, black (10YR 2/1) moist, weak coarse subangular blocky structure parting to weak fine granular slightly hard, very fnable, neutral, clear smooth boundary.
- A—7 to 14 inches, very dark grayish brown (10YR 3/2) silt loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular slightly hard, very triable neutral, clear smooth boundary.
- Bi1—14 to 19 inches; dark graysh brown (10YR 4/2) sifty clay loam, very dark gray (10YR 3/1) moist, weak medium prismatic structure parting to moderate medium subangular blocky hard, fnable, slightly sticky and slightly plastic, neutral, clear smooth boundary.
- Bt2—19 to 26 inches dark grayish brown (10YR 4/2) sity clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky hard, firm, slightly sticky and slightly plastic, neutral, clear smooth boundary
- 813 26 to 33 inches, grayish brown (2.5Y 5/2) saty clay loam very dark grayish brown (2.5Y 3/2) moist: moderate medium subangular blocky structure parting to weak medium subangular blocky hard, firm, slightly sticky and slightly plastic; few fine accumulations of carbonate strong effervescence mildly alkaline; clear wavy boundary.
- BCk—33 to 37 inches; light brownish gray (2.5Y 6/2) sity clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure hard, firm, slightly sticky and slightly plastic common fine and medium accumulations of carbonate; strong effervescence; gradual wavy boundary
- C—37 to 60 inches light yellowish brown (2.5Y 6/4) sitty clay loam blive brown (2.5Y 4/4) moist, massive, hard, firm, slightly sticky and slightly plastic.

moderately alkaline strong effervescence, few fine accumulations of carbonate

The thickness of the solum ranges from 30 to 46 inches. The thickness of the mollic appedon ranges from 20 to more than 34 inches. The depth to free carbonates ranges from 22 to more than 40 inches.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2 it ranges from medium acid to neutral. The Bt horizon has value of 3 or 4 (2 to 4 moist) and chroma of 1 or 2 it is slightly acid or neutral. It averages as low as 27 percent clay in some pedons and as high as 35 percent clay in others. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It is sitty clay loam, clay loam, or sitt loam. It is mildly alkaline or moderately alkaline.

#### Oahe Series

The Oahe series consists of well drained soils that are moderately deep over sandy and gravelly material. These soils formed in glacial outwash or alluvial sediments on terraces. Permeab ity is moderate in the upper part of the profile and rapid in the underlying material. Slopes range from 0 to 6 percent.

Oahe soils are similar to Delmont and Orion soils and commonly are near Delmont Eatin Highmore Mobridge, and Ree soils. Delmont soils are 14 to 20 inches deep over graveily material. Eatin, Highmore Mobridge and Ree soils have an argillic horizon and do not have gravelly material within a depth of 40 inches. Eatin and Highmore soils are higher on the landscape than the Oahe soils. Ree soils are in positions on the landscape similar to those of the Oahe soils. The moderatery well drained Mobridge soils are in swares. Orton soils have less clay in the upper part than the Oahe soils.

Typical pedon of Oahe loam 0 to 2 percent slopes, 155 feet east and 2 165 feet north of the southwest corner of sec. 15, T. 107 N., R. 68 W

- Ap—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine granular structure, soft, fnable, neutral, abrupt smooth boundary.
- Bw1—4 to 6 inches; dark grayish brown (10YR 4/2) loam very dark brown (10YR 2/2) moist, weak medium prismatic structure parting to weak medium subangular blocky; soft, friable; neutral, clear smooth boundary.
- Bw2-6 to 14 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist, weak coarse prismatic structure parting to weak medium subangular blocky soft firm; few thin patichy shiny coatings on faces of peds; neutral; gradual wavy boundary
- Ck-14 to 24 inches, grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak coarse

subangular blocky structure, slightly hard, firm common fine accumulations of carbonate, strong effervescence, mildly alkaline, clear wavy boundary

2C—24 to 60 inches multicolored very gravetly loamy sand, single grain, loose strong effervescence moderately alkaline

The thickness of the solum and the depth to free carbonates range from 10 to 21 inches. The depth to sand and gravel ranges from 20 to 40 inches. The thickness of the mollic epipedon ranges from 12 to 20 inches.

The A horizon has value of 4 (2 or 3 moist) and chroma of 2. It is slightly acid or neutral. The £w horizon has value of 4 (2 or 3 moist) and chroma of 2. It is neutral or midity arkaline. It averages as low as 16 percent dray in some pedons and as high as 30 percent dray in others. The Ck horizon has value of 5 or 6 (4 moist) and chroma of 2 to 4. It is loam or sandy loam it is midity alkaline or moderately alkaline. The 2C horizon has hue of 10YR or 2.5Y, value of 5 to 8 (4 to 7 moist), and chroma of 2 to 4. It is very gravetly sand or very gravetly loamy sand. It is midity alkaline or moderately alkaline or moderately alkaline.

#### **Okaton Series**

The Okaton series consists of shallow, well drained soils formed in clayey shale residuum on uptands. Permeability is slow. Slopes range from 15 to 40 percent.

Okaton soils are similar to Sansarc soils and commonly are near Betts, Java and Mr boro soils. Betts and Java soils formed in loarny glacial till and contain less day throughout than the Okaton soils. They are in positions on the landscape similar to those of the Okaton soils. Millboro soils do not have shale within a depth of 40 inches. They are on the less sloping, lower parts of the andscape. Sansarc soils contain more day throughout than the Okaton soils.

Typical pedon of Okaton bouldery sitty clay 15 to 40 percent slopes 450 feet north and 2,000 feet west of the southeast corner of sec 29, T ±01 N, R 69 W

A: 0 to 1 nch grayish brown (2.5Y 5/2) bouldery sitty clay dark grayish brown (2.5Y 4/2) moist, weak time granular structure slightly hard, fnable sticky and plastic, many fine roots, strong effervescence medly alkaline; abrupt amouth boundary.

AC—1 to 4 inches; grayish brown (2.5Y 5/2) and light yellowish brown (2.5Y 6/4) silty diay dark grayish brown (2.5Y 4/2) crushing to grayish brown (2.5Y 5/2) moist weak line and medium subangular blocky structure parting to weak fine granular hard, firm, sticky and plastic, lew fine shale chips, many fine roots, strong effervescence, mildly alkaline clear wavy boundary.

C1—4 to 8 inches; light yellowish brown (2.5Y 6/4) and light olive brown (2.5Y 5/4) clay dark grayish brown (2.5Y 4/2) crushing to grayish brown (2.5Y 5.2) moist, massive hard firm sticky and plastic marry fine roots, strong effervescence mildly alkaline gradual smooth boundary.

C2—8 to 16 inches, light yellowish brown (2.5Y 6/4) and light olive brown (2.5Y 5/4) shaly clay, olive brown (2.5Y 4/4) moist, weak coarse subangular blocky structure slightly hard, very firm, sticky and plastic, common fine roots, rock structure evident; common fine accumulations of carbonate strong effervescence; midly alkaline clear wavy boundary

Cr—16 to 60 inches light brownish gray (2 5Y 6 2) and pale yellow (2 5Y 7/4) shale dark grayish brown (2 5Y 4/2) and light yellowish brown (2 5Y 6 4) moist, common fine and medium nests of gypsum in seams, few fine roots in the upper part, strong effervescence, mildly alkaline.

The depth to bedrock ranges from 8 to 20 inches. Reaction is mildly alkaline or moderately alkaline throughout the profile

The A horzon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. The AC and C1 horzons have hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. The shale has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is mildly alkaline or moderately alkaline.

#### Oko Series

The Oko sense consists of deep, well drained soils formed in firm, crayey glacial till on uplands. Permeability is slow. Slopes range from 2 to 7 percent.

Oko soits are similar to Beacke soits and commonly are near Glenham and Promise soils. Beadle and Grenham soils contain less clay throughout than the Oko soits. Promise soits do not have an arguic horizon. At of these soils are in positions on the landscape similar to those of the Oko soits.

Typical pedon of Oko loam, 2 to 7 percent alopes, 135 feet east and 2 250 feet north of the southwest corner of sec. 9, T. 105 N., R. 68 W.

- A=0 to 5 inches, dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist weak medium piaty structure parting to weak fine grabular siightly hard very finable slightly sticky common very fine roots, neutral, clear smooth boundary.
- 8t-5 to 12 inches dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist, moderate medium prismatic structure parting to moderate medium and fine subangular blocky hard, firm sticky and plastic common very fine roots, neutral abrupt smooth boundary.

Blk—12 to 19 inches grayish brown (2.5Y 5/2) cfay dark grayish brown (2.5Y 4/2) moist, strong coarse prismatic structure parting to moderate medium and coarse subangular blocky very hard, firm sticky and plastic; common dark grayish brown (10YR 4/2) tongues very dark grayish brown (10YR 3/2) moist; few very fine roots, shiny surfaces on peds, common fine and very fine accumulations of carbonate, strong effervescence, mildly alkaline, clear smooth boundary.

BCk—19 to 23 nches grayish brown (2.5Y 5/2) clay dark grayish brown (2.5Y 4/2) moist liveax medium prismatic structure parting to weak medium subangular blocky; very hard, firm, sticky and plastic; few dark grayish brown (10YR 4/2) tongues, very dark grayish brown (10YR 3/2) moist few very fine roots; common line and medium accumulations of carbonate strong effervescence madky alkaline clear smooth boundary.

Ck—23 to 30 inches, light olive gray (5Y 6/2) clay grayish brown (2.5Y 5.2) moist massive very hard, very firm sticky and prastic common fine roots, fine and medium accumulations of carbonate strong effervescence, mildly alkaline gradual smooth.

boundary

C1—30 to 42 inches, light olive gray (5Y 6/2) clay olive gray (5Y 5/2) moist massive very hard very firm, sticky and plastic few fine accumulations of carbonate strong effervescence, mildly alkaline; gradual wavy boundary.

C2—42 to 60 inches; light olive gray (5Y 6/2) clay, olive gray (5Y 5/2) moist; massive; hard, firm, sticky and plastic, common fine and medium nests and seams of gypsum crystals, few fine accumulations of carbonate, strong effervescence, mildly alkaline.

The thickness of the solum ranges from 15 to 26 inches. The thickness of the mollic epipedon ranges from 7 to 20 inches. The depth to free carbonates.

ranges from 5 to 16 inches.

The A horzon has value of 4 or 5 (2 or 3 most) and chroma of 1 or 2. It is neutral or mildly alkaline. The B horizon has value of 4 or 5 (3 or 4 moist) and chroma of 1 or 2. It is neutral to moderately alkaline. The C horizon has hue of 2.5Y or 5Y value of 5 or 6 (4 or 5 moist), and chroma of 1 to 3 dry or moist. It is mildly alkaline or moderately alkaline.

## **Opal Series**

The Opal series consists of moderately deep, well drained soils formed in clayey shale residuum on uplands. When dry, these soils are characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Permeability is very slow. Skopes range from 1 to 25 percent.

Opal soils are similar to Millboro and Promise soils and commonly are near Promise and Sansarc soils. Milboro and Promise soils do not have share within a depth of 40 inches. Sansarc soils are 4 to 20 inches deep over shale. They are on the steeper, more convex parts of the landscape.

Typical pedon of Opat sity clay 6 to 11 percent slopes 2,200 feet north and 180 feet west of the southeast corner of sec. 15, T 106 N., R. 89 W

- A—0 to 5 inches; gray (10YR 5/1) sitty clay, very dark gray (10YR 3/1) moist, weak fine subangular blocky structure parting to weak fine granular; hard, firm, sticky and plastic, neutral; many very fine roots, clear wavy boundary
- Bw—5 to 15 inches grayish brown (2.5Y 5/2) clay vary dark grayish brown (2.5Y 3/2) moist, moderate coarse prismatic structure parting to moderate medium and fine subangular blocky extremely hard very firm sticky and plastic common very fine roots, neutral, gradual wavy boundary.
- 8C—15 to 22 inches grayish brown (2.5Y 5/2) dray dark grayish brown (2.5Y 4/2) moist leak coarse prismatic structure parting to weak medium and fine subangular blocky extremely hard very firm, sticky and plastic common very fine roots livery slight effervescence midity alkaline clear wavy boundary.
- C1—22 to 32 inches, light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist few fine prominent yearowish red (5YR 5/6) mollies, massive very hard, very firm, sticky and plastic, few very fine roots, few fine accumulations of carbonate, slight effervescence, mildly awakine, clear wavy boundary.
- C2—32 to 37 inches, light brownish gray (2.5Y 6-2) clay olive (5Y 5-3) moist few fine prominent yellowish red (5YB 5-6) mottles, massive hard firm, sticky and plastic few very fine roots few fine accumulations of carbonate strong effervescence, mildly alkaline, gradual wavy boundary.

Cr—37 to 60 inches, light gray (2.5Y 7/2) shale, grayish brown (2.5Y 5/2) moist, britle; few fine accumulations of carbonate; midiv alkaline.

The thickness of the solum ranges from 20 to 27 inches. The depth to free carbonates is less than 18 inches. The thickness of the molic epipedon ranges from 7 to 18 inches. The depth to bedrock ranges from 20 to 40 inches. The control section averages as low as 60 percent day in some pedons and as high as 65 percent day in others.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is clay or silty clay it ranges from slightly acid to midity alkaline. The B horizon has hue of 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 1 to 3. It ranges from neutral to moderately alkaline. In some pedons it has accumulations of salts in the lower part. The C horizon

has hue of 2.5Y or 5Y, value of 4 to 6 (4 or 5 moist), and chroms of 2 or 3. The Cr honzon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 7 dry or moist, and chroma of 1 to 3.

#### Orton Series

The Orton senes consists of well drained soils that are moderately deep over gravelly sand. These soils formed in glacial outwish or alluvial sediments on uplands and terraces. Permeability is moderately rapid in the upper part of the profile and rapid in the underlying material. Slopes range from 0 to 25 percent.

Orion soils are similar to Delmont and Oahe soils and commonly are near Delmont, Lowry, Lowry Variant, and Schamber soils. Delmont soils are 14 to 20 inches deep over grave ly material. The sity Lowry soils are more than 40 inches deep over gravelly material. Lowry Variant soils have less sand in the upper part than the Orton soils. Lowry and Lowry Variant soils are in positions on the landscape similar to those of the Orton soils. Oahe soils contain more clay in the subsoil than the Orton soils. Schamber soils do not have a more epipedon and have gravelly material within a depth of 10 inches. They are on ridges and terrace scarps.

Typical pedon of Orton loam 0 to 2 percent slopes.

990 feet west and 150 feet north of the southeast corner of sec 9 T 107 N R 72 W

- Ap -- 0 to 6 inches dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist weak medium subangular blocky structure parting to weak medium and fine granular soft, very friable neutral abrupt smooth boundary.
- Bw—6 to 14 inches dark grayish brown (10YR 4/2) loam very dark grayish brown (10YR 3/2) moist weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; neutral gradual wavy boundary.
- BCk 14 to 22 inches grayish brown (10YR 5/2) loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky sightly hard very triable common line accumulations of carbonate slight effervescence mildly alkaline gradual wavy boundary.
- Ck =22 to 30 inches, light brownish gray (10YA 6/2) fine sandy loam grayish brown (10YR 5/2) moist, weak medium prismatic structure parting to weak medium subangular blocky slightly hard, very friable few fine accumulations of carbonate strong effervescence mildly alkaline; gradual wavy boundary
- C1—30 to 37 inches, pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable; few fine accumulations of carbonate, strong effervescence; midly alkaline; gradual wavy boundary

2C2—37 to 60 inches, multicolored very gravelry sand; single grant, loose, coatings of carbonate on peobles; mildly alkaling; strong effervescence

The thickness of the solum ranges from 13 to 25 inches. The depth to free carbonates ranges from 7 to 15 inches. The depth to graveily material ranges from 20 to 40 inches. The thickness of the mollic epipedon ranges from 7 to 15 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2. The flw horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2. It is loam or sitt dam. The Ck horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 to 4. It is fine sandy loam, sandy loam, or loam. The 2C horizon is multicolored very graveity loamy line sand, very graveity loamy sand, very graveity sand, graveity loamy sand or graveity sand.

### Plankinton Series

The Ptankinton series consists of deep poorly drained soils formed in clayery and silty alluvium in depressions in the uplands. Permeability is very slow. Slopes are less than 1 percent.

Planfunton soils are similar to Kolls and Worthing soils and commonly are near Eakin, Highmore, Mobridge and Worthing soils. The well drained Eakin and Highmore soils are higher on the landscape than the Plankinton soils. Kolls soils contain more dray throughout than the Plankinton soils. The moderatery well drained Mobridge soils are in swales. Worthing soils do not have an Eleganizon.

Typical pedon of Plankinton sitt toam 120 feet north and 1 165 leet west of the southeast corner of sec 20, T 102 N R 68 W

- A=0 to 4 inches, dark gray (10YR 4/1) silt toam very dark gray (10YR 3/1) moist, weak tine granular structure soft, very fnable, many fine and very fine roots slightly acid clear smooth boundary.
- E—4 to 6 inches gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist, moderate thin platy structure soft very friable common very line roots, slightly acid, abrupt smooth boundary.
- Bt—6 to 24 inches dark gray (10YR 4/1) silty clay very dark gray (10YR 3/1) moist; moderate medium and coarse prismatic structure parting to moderate medium subangular blocky extremely hard, very firm, very sticky and very plastic common very line roots neutral gradual wavy boundary.
- BCk1—24 to 35 inches dark gray (10YR 4/1) sity clay very dark gray (10YR 3/1) moist, weak medium and coarse prismatic structure parting to weak coarse and medium subangular blocky extremely hard, very firm, very sticky and very plastic, common very line roots, few fine to coarse accumulations of carbonate ineutral clear wavy boundary.

- BCk2—35 to 38 inches; dark gray (10YR 4/1) sity clay, very dark gray (10YR 3/1) moist, weak medium and coarse prismatic structure parting to weak coarse and medium subangular blocky extremely hard very firm very sticky and very plastic few very fine roots, few fine and medium nests of gypsum and other saits few fine and medium accumulations of carbonate neutral clear wavy boundary.
- Ckzg. 39 to 57 nches grayish brown (2.5Y 5/2) sity clay, very dark grayish brown (2.5Y 3/2) moist, massive very hard firm sticky and plastic few very fine roots common fine and medium nests of gypsum and other salts few fine and medium accumulations of carbonate slight effervescence mildly afkaline gradual wavy boundary.
- Cg. 57 to 60 inches grayish brown (2.5Y 5/2) sity clay loam dark grayish brown (2.5Y 4.2) moist few fine distinct yellowish brown (10YR 5.4) mottles, massive hard, firm sticky and plastic few very fine roots few fine and medium nests of gypsum and other salts few fine and medium accumulations of carbonate slight effervescence mildly alkaking

The thickness of the solum ranges from 36 to more than 50 inches. The thickness of the monic epipedon ranges from 27 to more than 50 inches.

The A horzon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The E horizon has value of 5 or 6 (3 or 4 moist) and chroma of 1 or 2. The A and E horizona range from medium acid to neutral. The B1 horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is clay sifty clay soldy soam, or clay loam. It ranges from sightly acid to moderately alkaine. The C horizon has hue of 2.5Y or 5Y, value of 4 to 7 (3 to 5 moist), and chroma of 1 to 4. It is clay loam, sifty clay loam, sifty clay, or clay. It is middly alkaine or moderately alkaline. It has lew or common fine and medium accumulations of carbonates. In some pedons the 8C and C horizons do not have accumulations of gypsum.

#### Promise Series

The Promise series consists of deep, well drained soils formed in sediments weathered from clayey shale on uplands, fans, and terraces. When dry, these soils are characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil Permeability is very slow. Slopes range from 0 to 6 percent.

Promise soils are similar to Miliboro and Opal soils and commonly are near Carter Hurley and Opal soils. Carter and Hurley soils are on flats and foot slopes. Carter soils contain more sails throughout than the Promise soils. Hurley soils have a natric horizon. Miliboro soils have an argillic horizon. Opal soils are 20 to 40 inches deep over shale.

Typical pedon of Promise sitty clay, 0 to 2 percent slopes, 125 feet south and 335 feet west of the northeast corner of sec. 33, T. 106 N., Pl. 69 W

- Ap—0 to 7 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to weak fine granular hard, friable slicky and plastic, mildly alkaline; abrupt amouth boundary
- Bw1—7 to 10 inches dark grayish brown (2.5Y 4/2) ctay, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure parting to moderate medium and coarse blocky very hard firm, aticky and plastic common dark gray (10YR 4/1) tongues, very dark gray (10YR 3/1) moist, shirty surfaces on peds, moderately alkaline clear wavy boundary.
- Bw2—10 to 19 Inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium phamatic structure parting to moderate medium and coarse blocky very hard very firm sticky and plastic common dark gray (10YR 4/1) longues, very dark gray (10YR 3/1) moist common shiny surfaces on peds, strong effervescence moderately alkaline; clear wavy boundary.
- BCk—19 to 33 inches, grayish brown (2.5Y 5/2) ctay, dark grayish brown (2.5Y 4/2) moist, moderate medium prismatic structure parting to moderate medium and coarse blocky very hard, very livin sticky and plastic few dark gray (10YR 4/1) flongues very dark gray (10YR 3/1) moist common medium and coarse accumulations of carbonate strong offervescence, moderately alkaline, gradual wavy boundary.
- C—33 to 42 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure very hard very firm very sticky and very plastic few fine accumulations of carbonate strong effervescence, strongly arkaine diffuse wavy boundary.
- Cy—42 to 56 inches light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; few fine faint light once brown (2.5Y 5/4) moittles massive slightly hard firm very sticky and very plastic few fine distinct stains, strong brown (7.5YR 5/6) moist common fine to coarse nests and seams of gypsum crystals, strong effervescence moderately alkaline, clear wavy boundary.
- C'—56 to 60 inches light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist, few fine distinct yellowish brown (10YR 5/8) mottles, massive slightly hard, firm, very stickly and very plastic about 15 percent fragments of shale strong effervescence, moderately alkaline

The thickness of the solum ranges from 20 to 35 inches. The thickness of the movic epipedon ranges from 7 to 15 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is neutral or mildly alkaline. The B horizon has value of 4 to 6 (2 to 4 moist) and chroma of 1 to 3. It is mildly alkaline or moderately alkaline. The C horizon has hoe of 2.5Y or 5Y value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. It is diay or setty diay if is moderately alkaline or strongly alkaline.

## Ree Series

The Red series consists of deep we'll drained solds formed in loamy sediments on terraces and uplands. Permeability is moderate. Slopes range from 0 to 7 hardens.

Rea soils are similar to Glenham soils and commonly are near Delmont Grenham, Java Lane and Oahe soils. Delmont and Oahe soils are undertain by gravelly material. They are in positions on the landscape similar to those of the Rea soils. Grenham and Java soils are not set stratified in the C horizon as the Rea soils. Java soils are on the steeper more convex parts of the landscape. The moderately well drained Lane soils contain more clay in the subsoil than the Rea soils. Also, they are lower on the landscape.

Typical pedon of Ree (oam, 0 to 3 percent slopes, 130 feet south and 1,000 feet west of the northeast corner of sec. 27 T 106 N , R 68 W

- Ap- 0 to 7 inches, very dark grayish brown (10YR 372) loam black (10YR 2 1) moist weak medium and The granular structure, soft friable neutral, abrupt smooth boundary.
- 8t1 7 to 15 inches dark grayish brown (10YR 4/2) clay foam very dark grayish brown (10YR 3/2) moist, moderate medium or smatic structure parting to moderate medium subangular blocky hard firm, slightly sticky and slightly plastic middly alkaline, gradual smooth boundary.
- B12—15 to 20 inches brown (10YR 5/3) and dark grayish brown (10YR 4/2) day toam dark brown (10YR 4/3) and very dark grayish brown (10YR 3/2) moist moderate medium prismatic structure parting to moderate medium subariquiar blocky hard firm, slightly sticky and sightly prastic common fine and few medium accumulations of carbonate slight effervescence mildly alkaline diffuse wavy boundary.
- Ck—20 to 34 inches light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist massive hard, firm, siightly sticky and slightly plastic common medium and fine accumulations of carbonate slight effervescence moderately alkaline clear wavy boundary.
- C1—34 to 44 inches light brownish gray (2.5Y 6/2) sandy loam, plive brown (2.5Y 4/4) moist, massive,

- slightly hard, friable; few fine and medium accumulations of carbonate; moderately alkaline, slight effervescence; gradual wavy boundary
- C2—44 to 50 inches, light brownish gray (2.5Y 8/2) loam, dark grayish brown (2.5Y 4/2) and dive brown (2.5Y 4/4) moist, massive, hard, friable, few fine medium and coarse accumulations of carbonate, sight effervescence moderately alkaline gradual wavy boundary.
- C3: 50 to 60 inches light brownish gray (2.5Y 6.2) fine sandy loam once brown (2.5Y 4.4) moist massive signtly hard friable few fine accumulations of carbonate, slight effervescence, moderately alkaline.

The thickness of the solum ranges from 16 to 32 inches. The depth to free carbonates ranges from 12 to 25 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid or neutral. The Bt horizon has value of 4 or 5 (3 or 4 moist) and chroma of 1 to 4. It averages as low as 27 percent clay in some pedons and as high as 35 percent clay in others. It is neutral or midly alkaline. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It typically ranges from sandy loam to clay loam, but in some pedons it has grave by materia, at a depth of 40 to 60 inches. It is midly alkaline or moderately alkaline.

### Sansarc Series

The Sansarc series consists of shallow, we'll drained soils formed in clayey shallo residuum on uplands. Permeability is slow. Siopes range from 6 to 40 percent.

Sansarc soils are similar to Okaton soils and commonly are near Buildreek Chantier Gettys. Opal and Sully soils. Buildreek soils are more than 40 inches deep over shale. They are on foot slopes. Chantier soils are not so friable as the Sansarc soils and contain more talts. They are on the less sloping parts of the landscape. Gettys soils contain more sand and less dray throughout than the Sansarc soils. They are in positions on the landscape similar to those of the Sansarc soils. Okaton soils contain less dray throughout than the Sansarc soils. Opal soils are 20 to 40 inches deep over shale bedrock. They are on the less sloping smooth parts of the landscape. The deep Sully soils formed in loess. They are on uplands adjacent to the breaks along the Missouri River.

Typical pedon of Sansarc clay in an area of Sansarc Opal clays 20 to 40 percent slopes 2 500 feet south and 400 feet east of the northwest corner of sec 25. T 106 N R 71 W

A=0 to 4 inches grayish brown (2.5Y 5/2) clay very dark grayish brown (10YR 3.2) moist weak fine subangular blocky structure parting to weak fine and very fine granular; slightly hard, finable, sticky and plastic; common fine and very fine roots; neutral;

clear wavy boundary

C1 4 to 12 inches, light brownish gray (2 5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist, weak medium subangular structure parting to weak fine and very fine granular hard, fnable sticky and plastic many fine fragments of shale common fine and very fine roots sight effervescence, mildly alkaline, gradual wavy boundary.

C2—12 to 15 inches, light brownsh gray (2 5Y 6/2) very shally clay dark grayish brown (2 5Y 4/2) moist, massive hard, firm, sticky and plastic, common fine and very fine roots, about 50 percent weathered fragments of shale, few fine accumulations of carbonate strong effervescence; midfly aikaline,

clear wavy boundary

Cr—15 to 60 inches, light gray (5Y 7/2) shale, grayish brown (2 5Y 5/2) moist, mildly alkaline.

The depth to shale bedrock ranges from 4 to 20 inches. The control section averages as low as 55 percent clay in some pedons and as high as 65 percent clay in others. The A horizon has value of 5 or 6 (3 to 5 moist) and chroma of 2. It is neutral to moderately alkaline. The C horizon has hue of 5Y, 25Y, or 10YP. It is mildly alkaline or moderately alkaline.

## Schamber Series

The Schamber series consists of excessively drained soils that are very shallow over sandy and gravelly material. These soils formed in gravelly outwash on terrace remnants. Permeability is rapid. Slopes range from 9 to 30 percent.

These soils are taxadjuncts to the Schamber senes because they receive somewhat more precipitation than

is definitive for the series

Schamber soils are similar to Delmont soils and commonly are near Delmont. Oahe Orion and Sully soils Delmont soils are 14 to 20 inches deep over graveily material. Oahe and Orion soils are 20 to 40 inches deep over graveily material. They are on the less sloping parts of the landscape. The deep, sity Sully soils formed in loess. They are in positions on the landscape similar to those of the Schamber soils.

Typical pedan of Schamber :oam. 9 to 30 percent slopes, 730 feet east and 265 feet south of the northwest corner of sec. 11, T. 106 N., R. 68 W.

- A=0 to 3 inches, dark grayish brown (10YR 4/2) toam, very dark brown (10YR 2/2) moist, weak fine granular structure soft very fnable, many fine and very fine roots, strong effervescence, mildly alkaline; clear smooth boundary.
- Ck 3 to 20 inches, multicolored graveRy loamy sand; single grain, loose, few very fine roots, common coatings of carbonate on the lower sides of pebbles;

- strong effervescence; moderately alkaline; gradual wavy boundary
- C—20 to 60 inches, multicolored; gravelly sand; single grain, loose, strong effervescence; moderately alkaline

The depth to sandy and gravelly material is less than 10 inches. The A horizon has value of 4 to 6 (2 or 3 moist) and chroma of 2 to 4. It is slightly acid to moderately alkaline. The C horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is gravelly sand, very gravelly sand, gravelly loamy sand. The content of gravel ranges from 35 to more than 50 percent.

# Sully Series

The Sully senes consists of deep well drained soils formed in sitty losss on uplands. Permeability is moderate. Slopes range from 6 to 40 percent.

Sully soils commonly are near Lowry Sansard, Schamber and Uty soils Lowry and Uty soils have a mollic epipedon. They are on the less sloping parts of the landscape. Sansard soils are 4 to 20 inches deep over shale. They are in positions on the landscape similar to those of the Sully soils. Schamber soils are less than 10 inches deep over graveity material. They are on indees and terrace scarps.

Typical pedon of Sully sitt loam, in an area of Sully-Lowry silt loams, 9 to 25 percent slopes, 660 feet east and 1 400 feet north of the southwest corner of sec. 36, T. 104 N. R. 72 W.

- A=0 to 4 inches grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist, weak fine granular structure soft, very fnable; common fine roots, mildly alkaine, gradual wavy boundary
- C1—4 to 20 inches; brown (10YR 5/3) silt loam, dark grayish brown (10YR 4/2) moist; very weak coarse prismatic structure parting to weak coarse and medium subangular blocky soft, very fnable; common fine roots, few fine accumulations of carbonate, strong effervescence, moderately awaine, diffuse wavy boundary.
- C2—20 to 60 inches, light yellowish brown (10YR 6/4) silt loam, brown (10YR 5/3) moist; massive; soft, very fnable, few fine accumulations of carbonate; strong effervescence; moderately alkaline.

The depth to free carbonates is less than 5 inches. The soils are silt loam or very fine sandy loam throughout.

The A horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It is neutral or mildly alkaline. The C horizon has value of 5 to 7 (4 or 5 moist) and chroma of 2 to 4. It is mildly alkaline or moderately alkaline.

# **Uly Series**

The Uly series consists of deep, well drained soils formed in loess on uplands (fig. 12). Permeability is moderate. Slopes range from 0 to 9 percent.

Uly soils are similar to Highmore and Lowry soils and commonly are near Lowry, McCiure, and Mobridge soils. Highmore soils have an argillic horizon. Lowry soils contain less clay throughout than the Uly soils. McClure soils contain more clay in the subsoil than the Uly soils. They are in positions on the landscape similar to those of the Uly soils. The moderately well drained Mobridge soils are in swales.

Typical pedon of Uly silt loam, 2 to 6 percent slopes, 85 feet north and 1,820 feet west of the southeast corner of sec. 1, T 105 N., R 71 W

Ap—0 to 6 inches, grayish brown (10YR 5/2) sit loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable; neutral; abrupt smooth boundary

A—6 to 9 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; soft, very friable; mildly alkaline; gradual smooth boundary

Bw—9 to 17 inches, brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; mildly alkaline; clear wavy boundary

BCk—17 to 23 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist, weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; few fine accumulations of carbonate; strong effervescence; mildly alkaline, gradual wavy boundary

Ck—23 to 55 inches, pale brown (10YR 8/3) silt loam, olive brown (2.5Y 4/4) moist, massive; slightly hard, very friable: few fine roots; common fine and few medium accumulations of carbonate, strong effervescence; mildly alkaline; diffuse wavy boundary

C—55 to 60 inches, very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; soft, very fnable; common fine accumulations of carbonate, strong effervescence; moderately alkaline.

The thickness of the solum ranges from 12 to 30 inches. The thickness of the moilic epipedon ranges from 7 to 20 inches. The depth to free carbonates ranges from 12 to 25 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 2. The B horizon has value of 4 to 7 (3 to 5 moist) and chroma of 2 or 3. The A and B horizons range from slightly acid to mildly alkaline. They are sit som or sitty clay loam. The C horizon has hue of 10YR

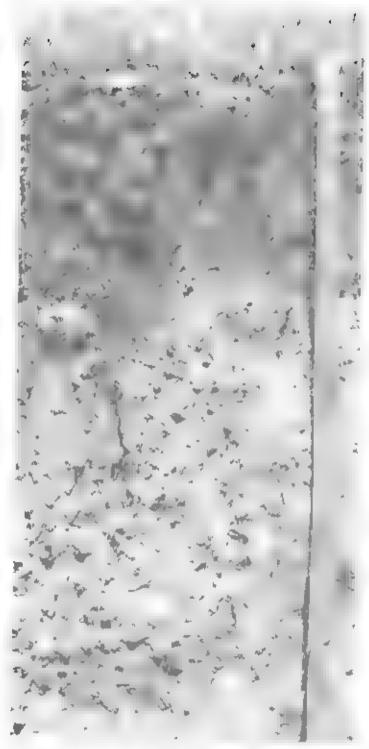


Figure 12.—Profile of Uly slit form, II to 2 percent slopes.

or 2.5Y, value of 6 to 8 (4 to 6 moist), and chroma of 2 to 4. It is mildly alkaline or moderately alkaline

#### Wendte Series

The Wendte senes consists of deep moderately well drained solis formed in alluvium on flood plains. Permeability is slow. Slopes range from 0 to 3 percent.

Wendte sons commonly are near Bullcreek and Promise soils. The nearby soils are on foot slopes and uplands. They are not stratified. Also, Bullcreek soils contain more saits throughout than the Wendte soils.

Typical pedon of Wendle silty clay channeled 350 feet south and 500 feet west of the northeast corner of sec. 28, T. 106 N. R. 70 W.

- A1—0 to 2 inches; grayish brown (10YR 5/2) sitty clay, very dark grayish brown (10YR 3/2) moist, weak medium and thick platy structure hard firm sticky and plastic, coatings of pale brown (10YR 6/3) fine sand grains on plates; common fine roots, slight effervescence; mildly alkaline; clear smooth boundary.
- A2—2 to 5 inches; grayish brown (10YR 5/2) sity day, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; common fine roots; slight effervescence; mikfly alkaline; clear smooth boundary
- C1—5 to 14 inches, grayish brown (10YR 5-2) sity clay learn, very dark grayish brown (10YR 3-2) moist weak medium subangular blocky structure weak bedding planes evident hard, firm sticky and plastic common fine roots, slight effervescence; mildly alkaline, abrupt wavy boundary.
- C2—14 to 26 inches grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist moderate medium subangular blocky structure; hard, firm, sticky and plastic, common fine roots, strong effervescence, mildly alkaline, gradual wavy boundary.
- C3—26 to 40 inches, grayish brown (2.5Y 5-2) and light brownish gray (2.5Y 6-2) sitty clay dark grayish brown (2.5Y 4-/2) moist; massive; hard, firm, sticky and plastic; few fine roots, strong efferivescence, mildly alkaline, gradual wavy boundary.
- C4--40 to 60 inches light brownish gray (2.5Y 6/2) silty clay dark grayish brown (2.5Y 4/2) moist massive, hard, firm sticky and plastic, few fine roots, strong effervescence, mildly alkaline

Reaction is mildly alkaline or moderately alkaline throughout the profile. The control section averages as tow as 35 percent clay in some pedons and as high as 50 percent clay in others.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The C horizon has value of 4 to 6 (3 to 5 moist) and chroma of 1 to 3. In some pedons it has layers of coarser textured material less than 2 inches thick.

# **Worthing Series**

The Worthing senes consists of deep, very poorly drained soils formed in allumium in depressions in the uplands. Permeability is slow. Siopes are less than 1 percent.

Worthing soils are similar to Kolls and Plankinton soils and commonly are near Beadle, Eakin, Highmore, and Jerauld soils. The well drained Beadle, Eakin, and Highmore soils are higher on the landscape than the Worthing soils. The somewhat poorly drained Jerauld soils have a natric horizon. They are in small pits and depressions. Kolls and Plankinton soils are poorly assessed.

Typical pedon of Worthing sity clay loam, 75 feet north and 2,560 feet east of the southwest corner of sec. 20, T 101 N., R. 68 W

- A=0 to 5 inches; dark gray (10YR 4/1) sitly day loam, black (10YR 2/1) moist; weak medium subangular blocky structure; extremely hard firm, slicky and plastic; common fine roots, organic mulch about 1 inch thick on the surface common fine brownish yellow (10YR 6/6) root stains, slightly acid, clear smooth boundary.
- Bt—5 to 18 inches; dark gray (10YR 4/1) sity clay, black (10YR 2/1) moist; weak coarse prismatic structure parting to moderate medium blocky extremely hard, very firm sticky and plastic common fine roots few concretions of iron and manganese code few fine brownish yellow (10YR 6/6) stains ineutral, gradual smooth boundary.
- Btg1—18 to 36 inches, gray (10YR 5/1) silty ctay, very dark gray (10YR 3/1) most; weak coarse prismatic structure parting to moderate medium blocky, extremely hard very firm sticky and plastic common line roots few medium concretions of iron and manganese oxide; few fine brownish yellow (10YR 6/6) root stains; neutral, clear wavy boundary
- Btg2—36 to 40 inches, gray (5Y 5/1) sitly clay very dark gray (5Y 3/1) moist weak coarse prismatic structure parting to weak medium blocky extremely hard, very firm sticky and plastic few fine accumulations of carbonate, slight effervescence, moderately alkaline, gradual wavy boundary.
- BCg—40 to 46 inches, gray (5Y 5/1) sitly clay very dark gray (5Y 3/1) moist weak coarse prismatic structure parting to weak medium blocky extremely hard, very firm, sticky and plastic, tew fine roots few fine accumulations of carbonate slight effervescence, moderately aixaline, gradual wavy boundary.
- Ckg-46 to 60 inches; gray (5Y 6/1) sitty clay, dark gray (5Y 4/1) moist; massive; extremely hard, very firm, sticky and plastic; common fine accumulations of carbonate; strong effervescence; mildly alkaline

The thickness of the solum ranges from 35 to 50 inches. The mollic epipedon is more than 35 inches thick. The depth to free carbonates ranges from 35 to more than 60 inches.

The A horizon has hue of 10YR or 2.5Y value of 3 or 4 (2 or 3 moist) and chroma of 1. It is slightly acid or neutral. The Bt horizon has hue of 10YR, 2.5Y, or 5Y.

value of 4 or 5 (2 or 3 moist), and chroma of 1, it is sifty clay or clay. It ranges from neutral to moderately alkaline. The C horizon is sifty clay sifty clay loam, or clay. It is midily alkaline or moderately alkaline. It has hue of 2.5Y or 5Y, value of 5 to 7 (3 to 5 moist), and chroma of 1 or 2.

# Formation of the Soils

Soil forms when chemical and physical processes act on geologically deposited or accumulated material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material the circulate under which the soil material has accumulated and existed since accumulation, the plant and animal life on and in the soil, the relief, and the length of time that the forces of soil formation have acted on the soil materia.

Cimate and plant and animal life are active factors of soil formation. They act on the parent material and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are modified by relief. The parent material affects the kind of soil profile that forms and in extreme cases determines I almost entirely finally time is needed for changing the parent material into a soil having genetically related horizons. Usually a long time is required for the development of distinct horizons.

The factors of socilormation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. The following paragraphs relate the factors of soil formation to the soils in Brule and Buffalo Counties.

#### Climate

Climate directly influences the rate of chemical and physical weathering. Brute and Bullalo Counties have a continental climate marked by cold winters and hot summers. This climate favors the growth of grasses and the resulting accumulation of organic matter in the upper part of the soil. The precipitation is sufficient to leach carbonates in most soils to a depth of 18 inches or more. The climate generally is uniform throughout the survey area and thus as a separate factor does not differentiate between the soils within the area. Additional climate data are given under the heading "General Nature of the Survey Area."

#### Plant and Animal Life

Plants animals insects earthworms, bacteria and fungi have an important effect on soil formation. They cause gains in organic matter, gains or losses in plant nutrients, and changes in soil structure and porosity in Bruie and Buffalo Countes the tall and mid praine.

grasses have had more influence than other living organisms on soil formation. As a result of these grasses, the surface layer in many soils has a moderate or high content of organic matter. Mobilidge soils are an example

Earthworms, insects, and burrowing animals help to keep the soils open and porous. Bacteria and fungi decompose plant residue, thus releasing nutrients that plants use as food.

#### Parent Material

Parent material is the unconsolidated organic and minera material in which sou terms it determines many of the chemical and physical characteristics of the soil, such as color texture reaction and consistence. The rate of soil formation is more rapid in the more friable loamy and sifty parent material than in other kinds of parent material. Also, more changes take place, and the horizons are more distinct.

Many of the soils in Brule and Buffalo Counties formed in glacial material derived from preglacial formations of granite gneiss limestone, and sandstone and from material weathered from the underlying Pierre Shale. Some glacial deposits consist of material sorted either by water as the material was deposited or by wind and water after it was deposited others consist of unsorted material or glacial till.

The glacial till generally is loamy or silty. Most of the silty glacial till occurs in Brule County. The loamy glacial till generally is in the northeastern part of Bulfalo County but I also is in a few scattered small areas throughout. Brule County. The loamy glacial till generally has scattered stones and boulders throughout.

The sitty glacial till was deposited on glacial ice and then reworked by water as the glacier melted. Highmore soils formed in sitty glacial till. Eakin soils formed in a thin mantie of sitty glacial till over loamy glacia. till Loamy glacial till is a muxture of clay sitt sand and grave that contains few to many cobbrestones and boulders. The content of pebbles and cobblestones is higher than that in the sitty glacial till. The proportion of each kind of material is determined by the kind of material picked up by the glacier. Among the soils formed in loamy glacial till are Betts ways, and Grenham.

The bedrock in the survey area dominantly is marine shale of the Pierre Formation that was deposited during tha Late Cretaceous Period. The Pierre Shale is dark gray to light gray and has beds of bentonite and seams of ilmestone iron, and manganese concretions. Opal and Sansarc are examples of soils formed in material weathered from the Pierre Formation.

Glacial outwash is sandy gravelly and loamy material deposited by gracial melt water. Delmont and Cahe soils formed in loamy material undertain by sand and gravel within a depth of 40 inches. They are on widely scattered terraces throughout the survey area.

Loess mantles the uplands above the breaks adjacent to lake Francis Case and Lake Sharpe Lowry and Uty so is formed in this si ty loess.

Mobridge Tetonika and Worthing are examples of sons formed partly or entirely in local alluvium washed from the adjacent sloping soils on uplands. Bon soils formed in alluvium deposited by streams.

## Relief

Relief affects soil formation through its effect on drainage runoff erosion plant cover and soil temperature. On the more sloping soils such as Betts soils, much of the rainfall is lost through runoff and does not penetrate the surface. Much of the surface soil is rost through erosion. As a result, these soils have a thin surface layer and are calcareous at or near the surface. Bunoff is slower on Eakin, Glenham, Highmore, and other less sloping soils, and more rainfall penetrates the

surface. These soils are calcareous at a greater depth than the Betts soils. Also, the horizons in which organic matter accumulates are thicker.

The Mobridge soils in swares receive extra moisture in the form of runoff from adjacent soils. The layers in which organic matter accumulates are thicker than those in the siightly higher adjacent Highmore soils. In low areas where drainage is impeded the fluctuating water table favors the concentration of salts in Durrstein, Egas, and other soils. Plankinton and Koils soils are in depressions where water ponds. They have the colors characteristic of poorly drained soils.

#### Time

The length of time that soil material has been exposed to the other four factors of soil formation is reflected in the kinds of soil that have formed. The degree of profile development reflects the age of a soil. The oldest soils are on the parts of the landscape that have been stable for the longest time. In Brule and Buffalo Counties, these are the Eakin, Grenham, and Highmore soils. The youngest soils either are those in which natural erosion removes nearly as much soil material as is formed through the weathering of parent material or are alluvial soils, which receive new material each time the area is flooded. Betts and Suilly soils are examples of young soils that are subject to natural erosion, and Bon soils are an example of young alluvial soils.

# References

- American Associationi of State Highway [and Transportation] Officials, 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vols., itlus.
- (2) American Society for Testing and Materials. 1974 Method for classification of soils for engineering purposes. ASTM Stand. D 2487-89. In 1974 Annual Book of ASTM Standards, Part 19, 464 pp., Illus.
- (3) Baumberger Rodriey 1977 South Dakota rangeland resources, Old West Reg. Comm., 150 pp., illus.
- (4) Flint, Richard Foster, 1955. Pleistocene geology of eastern South Dakota, U.S. Geot, Surv., Prof. Pap 262, 173 pp., illus.
- (5) South Dakota Crop and Livestock Reporting Service. 1967. Brule County agriculture. 62 pp., Blus.
- (6) South Dakota Crop and Livestock Reporting Service 1968 Bulfaio County agriculture. 62 pp., illus.
- (7) South Dakota Crop and Livestock Reporting Service. 1982 South Dakota agriculture—1981/1982, 46 pp., illus.

- (8) South Dakota State University 1962 Plants of South Dakota grasslands. A photographic study S. Dak Agnc. Exp. Str., Bull 566, 166 pp., illus.
- (9) United States Department of Agriculture, 1951 Soil survey manual, U.S. Dep. Agric, Handb. 18, 503 pp., illus.
- (10) United States Department of Agriculture, 1981, Land capability classification U.S. Dep. Agric Handb. 210, 21 pp.
- (11) United States Department of Agriculture, 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.
- (12) United States Department of Agriculture, 1976 South Dakota land use—1975 estimates. Soil Conserv. Serv., 25 pp., illus.
- (13) United States Department of Commerce, Bureau of the Census, 1979, 1978 census of agriculture, Vol. 1, Part 41



# Glossary

Altuvium. Material such as sand, sit, or clay, deposited on land by streams.

Area reclaim (in tables) An area difficult to reclaim after the removal of soil for construction and other uses Revegetation and erosion control are extremely difficult.

Argillic horizon A subsoil horizon characterized by an accumulation of illuvial clay.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	enches
Very tow	0 to 3
Low	3 to 6
Moderate.	5 to 9
High	9 to 12
Very high	more than 12

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Boulders. Rock fragments larger than 2 feet (50 centimeters) in diameter.

Celcereous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold dilute hydrochloric acid.

Chiseling. Titlage with an implement having one or more soil-penetrating points that shalter or loosen hard compacted layers to a depth below normal plow right.

Clay. As a soil separate, the mineral soil particles less than 0.002 milimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent sit

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Colluvium. Soil material, rock fragments, or both moved by creep, side, or local wash and deposited at the base of steep slopes.

Complex stope. Irregular or variable stope. Planning or constructing terraces diversions, and other water-control measures on a complex stope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains peliets or nodules of various sizes shapes and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—
Loose—Noncoherent when dry or moist, does not hold together in a mass.

Frable - When moist crushes easily under gentle pressure between thumb and foretinger and can be pressed together into a lump

Firm —When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When well, readily deformed by moderate pressure but can be pressed into a lump, will form a wire, when rolled between thumb and foretinger.

Sticky—When well, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard —When dry moderately resistant to pressure, can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Comented.—Hard; little affected by moistening.

Contour farming. Growing crops in rows that follow the contour

Control section. The part of the soil on which classification is based. The thickness varies among different lands of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete

Cover crop. A close-growing crop grown primarily to improve and protect the sox between periods of fegular crop production or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The waits of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. The thickness of weathered soil material over bedrock. The depth classes recognized in this survey are.

	and a second
Deep.	
Moderately deep	20 to 40
Shallow	into there 20

Depth to rock (in tables). Bedrock is too near the surface for the specified use

Drainage class (natural) Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage which is commonly the result of artificial drainage or impation but may be caused by the sudden deepening of channels or the blocking of drainage out ets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured rocky or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained —Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the moltling related to wetness.

Well drained —Water is removed from the soil readily but not rapidly it is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained. Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly dramed.—Water is removed slowly enough that the soil is wat for significant periods during the growing season. Wetness markedly

restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer a high water table, additional water from seepage nearly continuous rainfair or a combination of these.

Poorly dramed.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains well for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially dramed. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile seepage nearly continuous rainfall or a combination of these

Very poorly drained —Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently pended. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice or other geologic agents and by such processes as gravitational creep.

Erosion (geologic) Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym natural erosion.

Erosion (accelerated) Erosion much more rapid than geologic erosion mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables) Excess silt and clay in the soil.

The soil is not a source of gravel or sand for construction purposes.

Excess salts (in tables). Excess water-soluble salts in the soluthat restrict the growth of most plants.

Fertility, soil. The quarry that enables a soil to provide plant numents, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially

Foot slope. The inclined surface at the base of a hill Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots

Glacial outwash (geology). Gravel, sand, and silt. commonly stratified, deposited by glacial melt water

Glacial till (geology) Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the meiting ica. The deposits are stratified and occur as kames, askers, deltas, and outwash plasts.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water

through cropland

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter

An individual piece is a pebble.

Gravetty soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (? 6 centimeters) in diameter

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of

malurity or soon after maturity

Gulty. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O honzon.—An organic layer of tresh and decaying

prant residue

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, fron, atuminum, or some combination of these.

B horizon.—The mineral horizon below an O. A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these, (2) granular, prismatic, or blocky structure; (3) redder or

browner colors than those in the A horizon; or (4) a combination of these

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr honzon.—Soft, consolidated bedrock beneath the

A layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C honzon but can be directly below an A or a B horizon.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Invaders. On range, plants that are not a part of the original plant community that encroach into an area and grow after the native vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface soil.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border —Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed

uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or diches in fields of close-growing crops or in orchards so that it flows in only one direction.

Dnp (or thickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow: —Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Spankler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system. Subtrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is a lowed to flow onto an area without controlled distribution.

Leaching. The removal of soluble material from soil or other material by percolating water

- Eliquid limit. The moisture content at which the soil passes from a plastic to a liquid state
- Loam, Soil material that is 7 to 27 percent clay particles, 28 to 50 percent sitt particles, and less than 52 percent sand particles.
- Loess. Fine grained material dominantly of sitt-sized particles, deposited by wind.
- Low strength. The soil is not strong enough to support loads.
- Minimum tillage. Only the tillage essential to crop production and prevention of sor damage.
- Morphology, soil. The physical makeup of the soil, including the texture structure porosity consistence color and other physical mineral and biological properties of the valous horizons and the thickness and arrangement of those horizons in the soil profile.
- Mottling, soil Irregular spots of different colors that vary in number and size. Motting generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—few common, and many size—fine imedium, and coarse and contrast—faint distinct and prominent. The size measurements are of the diameter along the greatest dimension. Fine indicates less than 5 millimeters (about 0.2 nch). medium, from 5 to 15 millimeters (about 0.2 to 0.6 inch), and coarse, more than 15 millimeters (about 0.6 inch).
- Natric horizon. A special kind of argilic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.
- Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)
- Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen phosphorus potassium calcium, magnesium, suffur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.
- Organic matter. Plant and animal residue in the soil in various stages of decomposition.
- Outwash, glacial. Stratified sand and gravel produced by graciers and carned sorted, and deposited by gracial melt water.
- Outwash plain. A landform of mainly sandy or coarse lextured material of glaciofluxial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.
- Perent material. The unconsolidated organic and mineral material in which soil forms.
- Pedon. The smallest volume that can be called "a sod" A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10

- square meters), depending on the variability of the
- Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use
- Permeability. The quairty of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil Terms describing permeability are.

Very slow	less than 0.06 inch
S-ow	0.06 to 0.2 anch
Moderately slow	0.2 to 0.6 ench
Moderate	0.6 inch to 2 u inches
Moderately rapid	20 to 60 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

- Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.
- Piping (in tables). Formation of subsurface tunnels or piperise cavities by water moving through the sort
- Plasticity index. The numerical difference between the liquid limit and the plastic limit, the range of moisture content within which the soil remains plastic.
- Plastic limit. The moisture content at which a soll changes from semisolid to plastic.
- **Ponding.** Standing water on soils in closed depressions.

  Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.
- Poor fifter (in tables). Because of rapid permeability the soil may not adequately fifter efficient from a waste disposal system.
- Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.
- Profile, soil. A vertical section of the soil extending through all its honzons and into the parent material
- Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.
- Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent good, fair or poor on the basis of how much the present plant community has departed from the potential.
- Range site. An area of rangeland where cimale soli and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of

species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	736-4
Extremely soid	below 4.5
very strongly acid	4.5 to 5.0
Strongly aud	5 * 16 5 5
Medium acid	56 to 60
Stightly need	6 1 10 6 5
Newshills	66 to *3
Mirdly alkaline	7.4 to 7.8
Moderatery alkakne	2 9 to 8 4
Strongty alkahne	85 to 90
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rooting depth (in tables) Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots

Aunoff The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a sor separate individual rock or mineral fragments from 0.05 milimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil lextural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandatone. Sedimentary rock containing dominantly sand size particles.

Seepage (in lables) The movement of water through the soil Seepage adversely affects the specified use

Series, soit. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying materia. At the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Slit. As a soil separate individual mineral particles that range in diameter from the upper limit of day (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is the percent or more sift and less than 12 percent day.

Siltatone. Sedmentary rock made up of dominantly silt sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Slickspot: A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally sitty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the honzontal Percentage of slope is the vertical distance divided by honzontal distance, then multipled by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of honzontal distance. The slope classes recognized in this survey area are as follows.

	PORCERT
Level	0 to 1
hicarly sevel	0 to 2
Gently undulating	0 to 3
Gently stoping	2 to 6
Moderately stoping	6 to 9
Strongly sloping	9 to 15
Moderatory stoop	15 to 25
Strep	25 to 40

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables) Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil A natural three-dimensional body at the earth's surface, it is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Alikerte-
	fors
Very coarse sand.	20 to 10
Coarse sand	10 to 0 5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0 10 to 0 05
Sit	9.05 to 0.002
Citie	less than 0.002

Solum. The upper part of a sox profile labove the C horizon, in which the processes of sox formation are active. The solum in sox consists of the A, E, and B.

horzons. Generally the characteristics of the material in these horzons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—piaty (faminated) prismatic (vertical axis of aggregates longer than horizontal). columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grain feach grain by itself as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil, Technically the B horizon, roughly the part of the sour below plow depth.

Subsorling. Breaking up a compact subsoil by putting a special chisel through the soil

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiand regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter orain.

Surface layer. The soil ordinanty moved in tillage, or its equivalent in uncultivated soil ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "As horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncta. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series.

because they differ in ways too small to be of consequence in interpreting their use and behavior

Terrace. An embankment or ridge constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic) An old all uvia plain ordinanty flat or undurating, bordering a river, a take, or the sea

Texture, soil. The relative proportions of sand set and clay particles in a mass of soil. The basic textura classes, in order of increasing proportion of fine particles, are sand, loamy sand sandy loam, loam silt loam silt, sandy clay loam clay loam silty clay loam, sandy clay silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying, coarse, fine, or very fine.

Thin layer (in lables). Otherwise suitable soil material for the specified use.

Till plain. An extensive flat to undulating area underlain by glacia. till

Tith, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil which is the most favorable material for plant growth. It is ordinarily nich in organic matter and is used to topdress roadbanks, awas, and land affected by mining.

Trace elements. Chemical elements for example zinc cobalt, manganese copper and iron are in soils in extremely small amounts. They are essential to plant growth.

Upland (geology) Land at a higher elevation, in general than the alluvial plant or stream terrace, land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new senes name, but occurring in such a limited geographic area that creation of a new senes is not justified.

# **Tables**

TABLE 1 .- TEMPERATURE AND PRECIPITATION

A source our above . The entire of and ability of any another promess at all and entertail

	Temperature							Precipitation				
	dally	daily	P F # F	† Hazison	Minimum temperature	growing	A - 1 - 3g	Lous than-	there than—	daya wit	Ave to	
- +	-	3, 1		+	10000	TT	· · · · ·	1 'n		or more	+ + -	
GARN VALLEY	,				-	T .: .						
January	24.3	1 1-5 1	12,9	53	1 -10	0	1 0 25	1 6 05			1 2 4	
	31.6	0,8 1			] -30		0.28	0.05			3.4	
Pebruary			50.5	65	-26	25	144	-11	.70		, .0	
Marylamon	42.0	19.0	30.5	1 77	-13	87	174	.16	1.19	2	A	
		٠,	A* a	AR		467	h 44	4.5	2.01	,	~ + 3	
*********		9.9	4	11			2 -4	24	4_14		4	
Jida -	81 . T	54.5	68.1	105	36	843	2.99	1.59	4.21	6	-0	
	eq.	6 43	4.4	1 7	41		3.5	100	4 95	5		
Regulation	87.9	58.0	73.0	105	J (1)	1.023	1.98	184	2.93	i i	1 .0	
Suptember-	77.9	47.2	65.3	101	26	569	1,47	135	2.38	3	.0	
October	84.9	35.8	50.4	90	13	335	1.13	-29	1.80	3	. 7	
November	44.8	20,7	32,8	74	-8	30	-51	.05	.02	1	2.8	
Pecusber	31.2	9.2	20.2	60	-22	14	134	.09	.59	2	4.8	
Yearly: Average-	E # ,	1 1 1	45 8				+ · +					
						4,53	17,08	15 41	471	45	. "	
PARTHARAS		1						1				
January[	28.6	6,1	17.4	61	-21	16	,42	.18	.61	2	4.2	
February[	36.2	13.1	24.8	67	-16	31	-73	.21	1,19	3	6.0	
Mareh	47.0	23.0	35.0	80	-5	119	.99	-27	1.55	3	1 5.2	
Apr11[	62.9	16.9 [	49.9	90	15	308	8.46	.991	3.71	9	1.1	
Nay[	75-5	46.0	61.8	94	26	676	3.25	1.74	9.57	7	.0	
June[	84.6	58.2	71.4	103	43	942	3.63	2.01	5.06	7	1 .0	
July manage	91.8	64.0	77.9	107	1 46 (	3,175	1 2.40	.971	3.60	5	1 .0	
August	89.7	61.7	75.7	105	46	1,107	1.96	124	2.96	5		
September-	78.6	51.6	65.1	100	32	753	1.79	.61				
October	66.6	40.2	53.4	90	22	423	1.08	138	1.71		1 .1	
November	17.5		36.6	73	1	24	.71	.08			2.5	
December-	33.4		23.3	62	-17	7	-63	.50	,		5.5	
Yearly: Average- Extrems-	61.9	36.8	49.4	100	-24			=				
Total			-			5,581	20.05	15.45	24 35	48	24,8	

A growing degree day is a unit of heat available for plant growth. It can be factured by abiling the maximum has a limit to temperature below who i growth is winited for the principal grops in the area (400 F).

TABLE 2 .- PREEZE DATES IN SPRING AND FALL

[Data were recorded in the period 1951-79 at dans Valley and and in the period 1963-78 at Chamberlain;

					_		
				40,40			
					ra .	-	
Prince fry		20 F RW					
	7		-	F Mr	_	1	
TANK VALLEY							
Lest freezing temperature in spring							
1 year in 10 later than	ı	Hay	10	f Bug	23	f No.y	31
2 years in 10 later thus		Stage	h	Hay	18	May	26
5 years in 10 later than-	į	Apr 11	23	Hag	,	Hay	17
First freezing temperature in fall:							
1 year in 10 earlier than	150	rpLember	25	September	20	September	8
2 years in 10 earlier than-	ı	October	1	September	25	September	13
5 years in 10 earlier than	ļ	October	12	Dotober	6	September	21
1 44 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1							
-1 "F - 43 ==		k, m		flas	+	Water	
2 - 4-1 3 1		At = ,	. "	4	, -	Ya v	
Cymany to		\$ m1_	٠	4 P		Af	ı.t
First fran 2 fran 1 .e.s in fs							
. Wedn to .		etines	1.	d ter		eptent cr	5
Factor to 4 Im		1.5	ħ	,			
Factor in 5		4 1 4 4	-	rr		1.500	

TABLE 3 .- GROWING SEASON

[Data were recorded in the period 1951-79 at damn Valley and in the period 1963-78 at Chasherlain]

-		_	
	7 - 1 - 1 2 - 12 +	1 27 W 2	
Probability	77 50 7	"Tarre"	The state of the s
		Tag?	tal p
TANN VALLEY			
f years in 10	151	127	112
8 years in 10	158	234	117
5 years to to	171	149	127
2 years In 10	185	164	136
2 year to 10	192	372	142
MAME REATH			
9 years in 10	183	168	197
0 years in 10	190	174	151
5 years in 10	203	186	166
F years in 10	217	199	150
1 year in 10	4	219	170
The stee			

TABLE 4 .-- ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

May a	Sell sume	Brule County	Buffalo	
2,(1)		ž zes	: 5	Area Extent
1	Artesian silty clay loan			
	Beadle loam, 2 to 6 percent slopes		1,	B 1-1
Ę.,	Beadle loss, f to 9 percent slopes	2	*	Fact and
ip of	Beadle-Jarauid complex, 1 to 5 percent stopes	4 7	1	44.5
187	Pas lo .	1 4	1	1. 1 4
37	Por lo			11 7. 04
1,	75-7	A 4		b,
1	Carter-Promise complet-		4	
r	Cave-Jerauld silt loams			11 11
	Chantier-Sansars slays, 2 to 15 percent a petrons	T_1	F . 100	14.1 2.2
DeD	DeGroy-Eaxin-Jerauld mit ioms, 0 to 2 percent slopes-	+ H, T		f + h 7
20	Porna milt loam	4.47.4	2.4	2,44 .2
Du	Duccatein milt 1	, .	د یہ	113
ELL	Eakin-Dedray shit loams, 0 to 3 percent slopes	ting of	A M	The The State
-604	Egns variant silty clay loss	7,1	4.7	41 23
Piq	Pagesworth silt to the termination of the second se		1,	
Gell.	Settys almy lamm, 9 to 25 percent alopes		p ** **	4, 4 2
GoF GDA	Gettys clay losm, 25 to 40 percent slopes	1, 1		, , , , ,
at .	Glenham lows, 0 to 3 percent alopes			40 1 6 7
1tot.E	Highmore-Jave complex, 1 to 5 percent alones	Be. s	7,000	, 44, 44,5
Higg - X	Highmore-Java complex, 5 to 9 percent slopes	23,890	4.774	1 112
4 19		7 *	45 ,	47. 1. 6
4.5	F 4 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		. II	N 1
JUF	1 10	1 44 4	4. "	
40	1 1 ,	1	. 1	74
P P	1 "	4 4	47	,44
1.01	lowry wilt loam, 0 to 2 purcent alopes-	1,025	4 7	, ti 3
LoB	Lowry milt town, 2 to 6 percent slopes	690	2.350	1 3.0401 0.4
* water	Lowry Variant silt loss, 0 to 2 percent alogga	0	* * *	4. 4.4
EvB M.3	Lowry Variant sit loss, 2 to 5 percent slopes		* 4	Er Joh
Had	McClure silt loam, 6 to 11 percent slopes	580	565	1 1.1451 6.1
Mr. K	107		. 4	H, P U, S
34		**	4	ALP TO THE
Roll	Kobridge silt   019	17,845 ,	3.015	14.80 2 "
H		H	AL .	4.1
14		,	h . "	6 4 0 1
ь.	In the second se		1. 0.	3. 0.5
OKB	ORG TOWN & TO & beccent winds	1,140	4 15	1,7 0.2
QmD	Opal silty clay, 2 to 6 percent slopes		21,67	1 4 4 3 4 4
Opti	Opal dlay, seline, 1 to 6 percent slopes	ó I	8,115	1 6,115 1.0
Oca	Orthents, lossy-	260		La de la constantina della con
OUN	Orton load, 2 to 5 percent slopes	0	615 34,	615 0.1
w	Orton loam, 2 to 5 percent slopes	2.4	4.4	7
P16 F = 5	Plankinton silt loss	27,510	4,280	32,0901 3.9
. "		4.	1-1	1 1 7
Ball -	They loam, 0 to 1 befrent slopes	2.305	4.080	
Re P	Raw loam, 3 to 7 percent slopes	2.165	2,110	4,275 0.5
Saf	Nosk outgrop-January complex, 15 to 40 percent slopes-		27,225	1 1
Sall	Sansard-Opal diags, 20 to 40 percent alopen	13,760	6.835	1 1
等点形	Schamber loss, 9 to 30 percent slopes	A50	3. 4	4 4 4
		4	7	1
Soft.	[Sully-Lowry Allt loams, 9 to 25 percent slopes	1,120	1.040	/, 3
Unit	Wiy alix loam, 0 to 2 percent slopes	21.10	2 222	Cr. C.
	The same of the sa	3,140	2,090	1

lee footnote at end of table.

TABLE N .-- ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS-Continued

Map eyzat o	Soil name	design factory	Panns	4 4 -	
		A rea	£ /	F - 1 -	t.
18.63 18.73	y and was a formal a passage			. +	
H-3	he to at my casy		*		1
ii de	1 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	4 , 1		, ,	-1
Maria Maria	The error of the transfer of t	7,4	20 24		
MJ.	Part of St. A talk to present a commence of	, ~	1		
	Water (less than 40 acres)	4	L 4	4	
	Pig Bend up		4-	4	
	Total land area	5 "	271,744		
	Open water areas (nore than WG acres)	F 4 F	44.4		
	Total area				
		18 1 2	30 0 3		

<sup>·</sup> Less than 0.1 percent.

TABLE 5 .- PRIME PARKLAND

If y the motion of continuous formions are later. Tobar on a text a case of the a list area are a sufficient point fairs of fine is in prime fairnished broy unless contact of the list area are appendicable in parentheses after the soil name.

Ma gri .	Soll name	
		_
Ept.	Artesian milty clay loss (where drained)	
eğ .	Demois : as, '' b per err o .cs where tertained	
len .	Bon, loun	
20	Dorte silt lam (where irrigated)	
h&	[Glenham long, C to 1 percent alone (where feature)	
15.46	10 167 + 17 12 1 167 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
igB	INTERPOTERS GENERAL I CO & POPPOST BIANCE (which tenters to A)	
5+ U	the state of the s	
ds	n n n y ay 2" efect to ay a	
A	a why of his sec force per election as at each feetgate.	
7 B	MEN A AM T C C SHEET H C S HE M HE H C S A	
4	AMERICAN B. B. AD. T. prices a peak were no see a.	
+11	NOT THE B. C. B. C. LEW. C. P. LEW. C. B. LEW. LANSING CO. LEWIS CO., LANSING CO.,	
in B	INCULUTE BLIE 1988. 2 to b terrent wishes februar testerand	
5 L	The state of the s	
0.6	This sector was a substitute of the particular and the particular	
	(Montides size form	
t.A	former and a per store arraga of	
t B	Orton lose, O to 2 percent slopes (where irrigated)	
e A	Orton loam, 2 to 6 percent alopes (where irrigated)	
cB	Res loam, 0 to 1 con a man and a man a	
a A	Res loam, 3 to ' s t s	
4.5	Uly silt loss,	
d	Under silty of an anger in said	
	amonds strak . 25 stone ft \$4 vl	

# TABLE 5 .- LAND CAPABILITY AND FISLDS FOR ACRE OF CROPS AND PARTURE

Yiells are those that can be expected under a righ level of management. Absence of a yield indicates that the month is not surfect to the crop or the crop generally is not grown on the soil.

Sor name and	Land capability	Corm	Date	Spring sheat	Winter s'est	Grata	Aifeife hey	Bromegrana.
		Bu	Pila	Pu	Av	54 4 B	Tons	Cha
Artesian	III=-3	-	42	28	23	\$9	j_ ù	5.0
Sp.D.	IIIe-3	30	49	29	36	44	5.0	3-3
Petition	TV=7	33	40	26	30	39	1.7	2.6
esign	Itle-3 VIn-1		36	_	25	35	3.4	
He P	VIIo-3	****	_	_	***		_	10000
Res	114-3	60	69		113	67	3.3	5-5
h	VI w=1		-			_	-	-
P. Fees	VI s=5				-	_		_
Carrer arter	VI n=1					-	-	
q Free Pr stiss			4-4-4	 		wheth		
Cave					- t		0.7	1.2
CaD	Y*e=5			-		-	-	
e cey:	17x-2	27	33		29	30	1-2	3 0
DeD	V50-9	_	_		_	15		_
Downia	lie-i	34	47		32	42	2.1	3-5
Durratein	VIW-4							
Eaxin	IIc-5	38	46	22	29	44	1.7	1 28
Egan	J*====================================	u-de-fe		1	1			
Egna Variant	Vi-1			-	-		***	

See foothotee at and of table.

TABLE 6. -- LAND CAPABILITY AND YIELDS PER ACHE OF CHIPS AND PASTURE-Continued

Soil name and map symbol	Land capability:	Corn	Data	Spring	Winter	Grain	ALTALIA hay	
		Bij	Tit.	Wheat Bu	Wheat Bu	Bu	Tone	A In Id
Farmaworth	IVa-2		42	17	23	36	2.0	3.3
GeE Gettys	VIe-3	-					-	
Gettye	V210-3		_	_	- :	_	-	-
dha	IIc-2	39	56	26	35	4.7	2.1	3 5
Glenham	IIe-2 IIIe-12		49		30	43	2.0	3.3
Highmore Jave	Ile-1 Ille-12	4.6	50 J		3.2	46	1.9	3.2
Highmore Java	IIIe-1 IVe-3	35	47	_	25	40	1.8	3,0
Highmore	IIc-2 IIc-3	56	63	29	39	62	2,6	4.3
Hon Hurley	VZn-1	-	-	_		_	-	
Rea	VI=-1 VIII=-3							
Java-Betta	VIo-3	***	- [		-			
Java Olenham	IVe-1 lile-2	27	41	19	23	28	1 7	2.8
folls	Yest	-					-	
Lane	He-1	50	65	20	37	56	2-6	4.3
Lune	IIs-1 IV(-2		54	23	29	46	2-3	3.6
Loury	IIc-2	43	53		30	42	2.0	3.3
Lowey	lle-i	40	49		33	37	1.9	3+2
Lowry Variant	IIIe-2	25	38		30	30	1.3	2.2
Lowry Variant	IIIe-6	23	35	***	58	26	1.2	2.0
McClure	Ile-I	38	48		35	47	2-1	3.5
McClure	1110-2	32	43	į	29	42	1.8	3-0

See footnotes at end of table.

TABLE 6 .- - LAND CAPABILITY AND YIELDS PER ATRE OF THE PS AND PASTINE -- Ontinued

Soli name and gap symbo.	and capability	form	Outs	Spring	Winter + mai	Seate m mgh am		Eronegrans-
		<u>B4</u>	<u>Buj</u>	22	8.4	žh.	To the	Y 264
MbA	IIIs-3 '	38	55		40	5.		3 . 3
Milbaro	IIIe+	36	50	,	37	48	+ + 9	5.2
Mb; Kilaboro	IVe-t	31	43		32	19	:	7
Moa	IIc-3	60	76	4.4	42	67	3.0	5.0
F helige		42	4.8	***	33	4.7		4 7
Cate	IIIs-2	30	4.16	₹.	25	31	1	2,3
YS	IIIe-6 Ive-6	27	35	1	22	25	4	1.8
Cef	VII-8					٠		
)ko 0kg	IITe-N	31	49	.9	30	41		4.2
уп.н раз	1110-4	25	45	21	3.	16	1.4	4.4.5
DmC	TVe=4	24	40		28	le	4-3	2 2
of Base	VI = ~5						:	
inthents	VI 18-2						,	
rior r	, IIIe-7	22	36	19	54	26	1.4	4.8
Oth.	11'e-8		23	1 15	23	22	t 1.0	/
DwE	VI == 6 VI == 4		***				1	
Panathinh	1 Var-1	45	+5			14:	1	4.5
Promise	F-m111	33	50		30	46	* * * *	4.4
Francise	ITTE-4	37 [	48		35	ন্ধ	1,6	. 21
Res	11c-2	39	57	24	15	46	9	4-2
В+Р	II+-1	3.5	55	23	3 s	ar.	15	4. >
RoPOS New Strop Satesfor	VIIIs-2 VIIe-B							

See footnotes at end of table.

TABLE 6 .- LAND CAPABILITY AND YIELDS PER ACHE OF CROPS AND PASTURE-Continued

Soll name and ( map symbol	Land capability	Corn	Oats	Spring wheat	Winter w.est	Orain sorghum	Alfalfa bay	BATO ER
		Bu	<u>Au</u>	<u>Ð.</u>	<u>Liba</u>	Bu	Tons	YINA
Sansaro	VIo-12 VIa-4	-					_	
Sensace-Opsi	VI to-8		-	4-7-0			-	_
log Schauber	A2 =-p		***		-			_
MP	Y2.10-3						-	
sor Sully	IVe-3 IIIe-1	29	33		21	26	1.5	2.5
Solly	VIe-3		***			444		_
Sully	Aio-3							
Jak	11c-2	48	60		36	48	2.4	1,0
Dly	He-1	42	55		34	46	2.1	3.5
Unit	file-1	35	45		29	37	1.7	2.8
Wendte	IIIa-3	35	55		35	50	1.7	2.8
Wendte	VIw-1							
Wo-thing	W-L	appelle de						
Wp	VIIIm 1				***		m-d-d	

<sup>\*</sup> Anthony-unit-month The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

\*\* Bee description of the map unit for composition and behavior characteristics of the map unit.

TABLE T. -- RANGELAND PRODUCTIVITY
, Only the soils that support rangeland regetation suitable for grazing are listed

Soil name and map symbol	8		tial annual property	
	Range site	Favorable	Average	Jafavoratie
		Lt aure	L acre	rp σr .ē
Artesian	3ubirrigated+	5,590	5,000	4,033
Behdie	'Clayey	3,200	2,700	1,900
Bg80 Beadle	Clayey	3,200	2,700	1,900
	Thin Claypan	1,900	1,600	1,100
Bu7+	f			
	Thin upland	- 177	2,100	1,500
Java	1511ty	3,100	2,600	1,800
Btr	Overfice		3,800	3,000
Bos spendionally				
flooded	5ublr=1galed	4,800	4,400	3,500
Bon, excely flooded	Overf.ou	4,200	3,800	3,000
Bussereek	Dense Clay	2,000	1,700	1,200
Carter	This Claypan	2,130	1,900	1,100
Cp+	Thin ", sypan			
		1	1,900	1,100
	^. Ajey	3,300	2,800	5,000
Cayp	- ^_aypan-	2,600	2,300	1,600
Jerauld	Thin Claypen	1,900	1,600	1,100
Cant Chantier	Dance Clay	3.000	1 700	
	Station Clay-		1,700	1,206
Dake			2,100	1,500
	Claypen	2,800	2,300	1,500
Eakin	Silty	3,700	3,100	5,200
Jerauld	'Thin Claypan	1,900	1,600	1,100
Dermont	Shallow to Gravel	5,300	1,900	1,100
Dorna	811ty	3,100	2,600	1,800
Durratein	Saline fowland	3,300	3,000	2,400
Em.A.4		1		,
Eakin	\$11ty	3,706	3,100	2,200
Dedrey	Claypan	2,800	2,300	1,500

See footnote at end of table.

TABLE 7. -- MANUELAND PRODUCTIVETY -- Continued

Soir name and			Frent'al about production fresh of greatly seem n				
wap symbol	Kange site	Fav PA .e	Average	hfay rate			
		4.76	- 1 <u>FO</u>				
Egas	-! Saline Low.and	3, 00	3,400	2,786			
Egas Variant	Wetlend	4,400	\$,u00	3.200			
Parmaworth	Craypan	2,400	2,000	4,200			
Gef, Gef	(This Upland-	1,100	2,000	1 1,80			
DhA	51:ty	5,400	7,860	2, 2			
)µRP Q. enham		4,400	2,800	6,14			
Javanness	. 51, ty	5,.00	2,600	1 4,8			
Kgta, Hgas							
Highmore	11.ty	3,700	1,100	2, 60			
Java	Stity	3,.00	2,600	4 , BC			
h.i.g.hhozdonovonum	11:17	3,700	5, 200	2,11			
Mobridge	Overf, de-	4,800	4,000	2,800			
Inh.	Thin .Aypan	+,700	1,400	40.			
la A <sup>4</sup> Hupley	Thin Jaypan	1,730	1,421	40.5			
Satemapota,	1	4					
1614	į			1			
J478	1*11ty	3,100	2,560	1,000			
Betts	Thin prand	2,600	2,300	1,600			
gre Jare	51:17	3,100	2,600	1 100			
	511ty			1,800			
	Closed Depression		2,836	4,500			
No.L.	Closed be presented	3,700	3,400	2,406			
Lahe	Clayer	3,100	2,800	5.000			
,ге Селя	Clayey	3,300	2,800	2,000			
Farmaworth	: aypan	; 2,400 ;	2,000	1,200			
	511ty	1	2,600	1,800			
	Silty	3,100	2,400	1,900			
et, Mac	S11ty	2,800	2.300	1,600			

See footnote at end of table.

TABLE 7. -- HANDE AND PROCESSIVETY -- Continued

Soil name and		for a d f growing season			
map symio.	Hange site	Payorabije	Aserago	lnfav-rab.e	
-		1 a -e	-1 4 g	an 4 1/4	
NA, MEN, MbC	- ' Eysy	300	2,500	1.800	
tokanananan menerakan kelangan menerakan mener	1 4041.081.081.081.081.081.081.081.081.081.08	a , 400	4,600	2,820	
tp# Motridge	West tuan	4,950	4,.00	2,800	
Pieneinton	- Cosed Depressi n	3,900	3,500	2,506	
Name of the Control o	- 1,10,0000	3.1.0	2,600	1,850	
1110				1	
M /4	- 1.17	4,100	2,637	1,800	
Delmont	realow to drawe	2,500	2,100	1,300	
WEST 25	· 1000 - 1000000000000000000000000000000	1,940	1,600	1,100	
RP	- ayey	3, 6 0	2,100	1,900	
1811, 18 +	- ,EVEY	2,100	2,400	1,700	
154	. while aye a second-control control	2,420	1,800	1,100	
Ptf, std + +	- 4013	4,150	2,600	1, H - 3	
DWK+	40/19	3,100	2,600	1.00	
* + apreparation	. yery fal, severe	1,400	1,200	7 0	
Passes - Control	set .heprade* h	3,200	3,500	2,564	
PrA Process of As	. · • • • • • • • • • • • • • • • • • •	9,500	2,8	., 766	
REA, HeB +	. I tyrur spannensurvevenannens	1,500	2,900	r, 0	
Payd hack on Trap.	,				
*4*4450=================================	- pd ton 133	2, 2	2,100	1,500	
Marking and a second of the se	- Share will again ann ann ann ann ann ann ann ann ann	2,50	2,100	1,500	
[M]		2,60.	5,200	: 100	
T Farty An Canada	. cory the covernment of the contract of the covernment of the cov	* * # D %	1,200	70	
	- This pulp has been been been been been been been bee	2,600	2,20	1,50	
A4	- Thin grant	2,950	2,400	1,700	
				1,800	

See footnote at end of table.

TABLE T.- RANGELAND PRODUCTIVITY-Continued

Sol. name and		Forential annual production for kind of growing assen				
map ayabol	Rhoge elte	Favorat e	Average	Julayorat .e		
		Dt alse	Li.a.c	Lb a re		
to Re						
Silvay	Thin Upland	2,900	2,400	1,700		
Schamber	Very Shailow	1,400	1,200	7.0		
Jak. UsB, UsC	Silty	3,420	2,800	2,000		
ld	Over[.ov	4,000	3,300	2,400		
Wendte	OverF10W	3,500	2,900	2,000		
Worthing	Shallow Marsh	6,800	6,200	5,000		

<sup>·</sup> See description of the map whit for composition and behavior characteristics of the map unit,

#### TABLE 6 .- WINDOWNARS AND ENVIR AMERICAL PLANTINGS

The symbol means wess than means more than. Atsonce of an entry holl also that trees generally do not given beight on that soil]

Sell mame and map syste	5	8-44	AP E	ь	45
	+				
	Sener are are	Tararian	e or sq pire,	Py 1-8%	equal m
Artesian		i e a	gree a		* STREET,
		product .	1 / 4 77		
		Amen's an policy	h c a m erry,		
			canter respect.		
ea, re*	Think also away.	B garana ye	re at ,	LUPET 42 P 20 1 AA	
Foud e	alas.	ea firm neinedan,			
		Ms at at at an end of			
		9 1,500			
		To an Ab			
		K E,			
		peas rule			
		pras			
Kb.					
Seed -	Talankhanh Bamada	F Bildry Vey	Part 4	1 65 44 6 5	
		Mark Set Ut	Horey dr		
		4 , P P P 7			
		Markette Markette			
		A - A			
		- 12			
		bear into			
Jeray d.					
Ber 94					
Bella.					
Java.					
0-0-				P'y 31	
B. n	i ar-	A ne at page.	3 1 7 7 67FF	ry Therenes	70/3
		Ta a a			
		baneyau wiew	A A W P W		
			ear of this elan		
ila a					
Bull reest					
a.					
farzer					
farter.					
Promise comme		ba cheery,	areas and,		
	taining a like e.	cation reueing,	iedan cara		
	peast out.	Ma F F'AF	ALCOND. CLEA		
	BY WICHAN BURBE,	na atque, F kv			
	41.85	Migrifalo fablishes			
( a v 0	fresh && .	iber ar e p,			1 Ave
	Pussur live,	poblemos pine.			
	eastern med elar.				
	at are atactan				
	bireysackie,				
	i's s'zer Fuffa oherny				

TABLE 8 .- WINDSHEARS AND ENVIRONMENTAL PLANTINGS -- Continued

3rd name and	1	rees having predict	ed 2d-year overage	beignts, in feet, of -	£ -	
ant place and	8	8-15	16-25	26-35	>35	
erau.1.						
lantler.				1		
c royamana.	Eastern redcedar, Rocky Mountain juniper, Siberian pesshrub, silver buffaloberry, lilec.	Siberian elm, graen ash, ponderosa pine, Russian-oliva.	200 607-507		<del></del>	
Kgg f pananananana	Tatarian honeysuckla,	Eastern rodceder, common chokecherry, Siberian peasbrub,	Ponderosa pine, green seh, hackberry, Russian-clive, honeylodust, bur cak.	Siberian electronic		
Jermuid						
UeD e.scot	Lilau, Peking	Bur oak, eastern int elar, ko ky Mountain juniper, pondarosa pine, Harchurian crabappie, Siberian	Siberian ein, . rey or st. greet act, Russ, and c.ive.		-	
		peashrub.				
Dorns.	Tatarian boneyeuskle,	Eastern redeeder, common chokecherry, Siberien possbrub,	fonderous pine, green mah, Nussian-olive, honeylocust, bur ouk.	Siborian ele		
Du. Durrstein						
EnA						
Eskin	Tatarian   homepauckie,   lilao.	Enstern redeckr, dommon chokecherry, fire https://example.	Fonderosa pine, green sah, kaskberry, Ruesian-oliva, haneylogust, bur oak.	Siberian elm		
fle/firey	Fasters retredar. Rocky Mountain jumiper, Siberian penshrub, allver t ffasterry, lithe.	green ash, ponderose pine, Russian-olive.				
Ng Liter						
tu Francisco						
Fa	Eastern redcodar,	Siberian e.m.	***			
Purmouorth	Rocky Mountain juniper, Siberian peashrub, silver biffaloburry, lilad.	green ash.				

TABLE 8 .- WIN DEFAKS AND ENVIR WEENTAL PLANTINGS -- CONTINUES

	· Un	ers having prest to	is Deyear average beights, in fest, fee				
man ayabol	8	5-15	,5-25	26-35	45		
er, Jer Jettys			1				
J.enhan	horeypunkle,	Fairen reledan, into a se herry, a se ha peas rub	Posternas pine, grei na v k aig v ive, r egs at, but ak, burkberry.	siterian con+	***		
% П <sup>ф</sup> т Ф <sub>1</sub> мой <b>ш</b> п	Tutarian honeysuckis, [ iiiac,	Pastern redredan,	Systemosa plos, Kred sr., Krasia r.iws, bre, a, bur cak, ha gterry.	therian outerers			
1948	buffaloberry, eastern reducdar, diberian passhrub, raterian homeyauckle, Peking cotomeaster, lilag, skunkbush sunac.	p oferos pine, k = i = i v green wah, Rocky Hountain juniper.	Siberian e.m.				
Ngha, KgCa Migrater	maramian e meyarkin.	'tnetern respedar, common chokecharry, Siterian peasureb,	fonderosa pine, graen ash, hackberry, Russian-olive, honeylocust, ber oak,	iberian extra	glander dip		
Javan	Silver  rea terry,  entire releder,  retire  entire,  to arise  honeysuckle,  Paking  outommatur,  lilan, skunkhumh  sumsc.	Ponderosa pint, Russian-oliva, gree sol, Fisar W at talk lumituer.	Siberian pla				
Mighmoster and one	Tatacian honeysuckles	Exators rei miar, comion chokenherry, Siberian peashrab,	Prime de prot, prime de prot, Primer;	iterias datas			
Mobridge		honeysuckle, Siberian peashrub, American plum.	the same to be the same to be a series to be the same to be the sa		Vanderta us la		
Hob. Harity				Þ			
Haff Harley.			1				
Slickspots,		1		4			

TABLE S .- WINDEREARS AND ENVIRONMENTAL PLANTINGS CONTINUES

Soil name and	·———	Trees having predi	eted 20-year sverage	beights, in feet, of.	
map symbol	.8	8-15	10-25	26-35	- 15
Jers Java. Berta.					
3400			i		
Java	buffaloberry, eastern redoeder Siberian peastr.b. Ta acian horeysuckie, Peking cotoneaster.	Fonderosa pine, Russian-olive, green ash, Rock; Hountain juniper	Sibertan ele-	Technologies (Control of Control	
	illad, skunkbush		1		
Glenham		Eastern redceder, common chokecherry, Siberian pesshrub,	Ecten ann. narkborry, Hissia - live, Bobmy.ocust, bur	Siberian el	
Co Kolim			O BAK 4		
Lane	Taterian homeyauckle, lilac.	Eastern redoeder, common chokecherry, Siberian passhrub.	Ponderosa pine, green ash, hackberry, Russian-clive, honeylocust, bur osk.	51berian elm	
re:		1		1	
iana	Tatarian horeyswekle, lilae,	Eastern redomder, common chokenherry, Siberium peashrub,	Ponderosa pine, green sah, haukberry, hassian-olive, homeylocust, bur	Siberian ele	
Faredworth	Eastern redeciar. Nocky Mountain jumiper. Siberian peashrub, milver buffaloberry, illac.	Sincrian dia, groom ash, podder se pine, Russian-orive,		m.qo	
nė, Lob	Teturina honeysuckle, lilac,	Bastern redoedar, common chokecherry, Siberian peashrub.	Ponderosa pine, green ant, handborny, Russ.an-n.ive, haneplocust, bur oak,	Siberian els-	
A, Lyb.	Tatarian benayalokle, .l.ac	Eastern redcedar, common choxecherry.	Honeylooust, green ash, backberry, pondeross pine, Mussian-olive, bur oak.	Siberian els	
a, Mada	Tatarian honeymack.e.	Eastern redeedar, Siberian peashrub, common chokecherry,	Ponderosa pine, bur onk, huckberry, Russian-olive, green ash, honeylocust.	Siberian elm	

TABLE 8 .-- WINDEREARS AND ENVIRONMENTAL PLANTINGS -- Continued

Soil name and							
map symbol	d	8-15	16-25	26-35	>35		
b⊼ <b>, И</b> ъй <b>,</b> Иъ¢	Siberian pesshrub, This lin- honeymankle, lilac.	Eastern redcedar, Reley Must a. Juniper, Russian- olive, Manchurian erntappie.					
ç <u>ğırını</u> Kobridge	Lilac	Tatarian honeysuckie, Sibecian penshrub, American plum.	Pondeross gine, blue eprude, greef ham, he kierty H av ar to besry, eastern redeedar.	Honeyloouet	Enstern sottomwood.		
4							
W t Hidge	1, 10	Taistlan honsyauskie, Siberian peathrub, American plum.	thirt. as pire, blue apru e, grach mah, bacaberry, Sugaian mulberry, eastern redocdar.	Hohe, forust	たっ = 無行の場。		
Plankinton.					1		
Unite	aparitrian.	Ponderosa pine, grees ash, iberian peashrub, Bocky Mountain jumiper, Hussian-olive, eastern redcedar.	Siberian ele	w-8 +			
399 :	1						
Oahu	1	Ponderosa plac, sceen ash, 'lberian peashrub, Rocky Nountain Juniper, Hussian-olive, castern redcedar.	Siberian elm				
De loon taanaanaa	Line, Peking sotomenster,	Bur cak, eastern redesdar, Hocky Mountain juniper, ponderosa pine, Manchurian crahappis, Siberian peashrub,	Siberian eim, honeylocust, greem ash, Russian-olive,	_	Week 52		
of. Santon							
kB Oko	Common shokeoberry, American plum, silver buffaloberry, levist	Rackberry, Russian-clive, castern redredar, Siberian prabapple,	incer an's po inc on pine, n terum, nome	www.w	,		
71.5, 20	Tatheran	Hackberry, Hussian-olive, austern redoedar, Manchurian erabapple, Rocky Mountain juhiper,	lee o use, tirey 15', Siberies e.c.		,		
t .							
	h						

TABLE 6 .-- WINDERPARS AND EMPIRORMENTAL PLANTINGS -- Continued

Soil name and	Trees having presinted 2) year average beights, in feet, sin-						
map symbol	8	8-15	16-25	26-35	>35		
Or Orthonia							
OtA, OtB Orton	Sibrian peachrub Peking cof measter, litec.	Posice as pine,  Marinian  Lossian Live,  Passian Live,  matert out eter,  Lossian painter,  Mountain juniper.					
N EP							
Orton	Siberian penshrub Peking cotonwaster, lilac.	Ponderosa pine, Ken ru tan dra bay a, Puselan-o ive, eastern methedan, but de, Burcy Rountain imipen,	]	- [			
Schamber.				1			
Pa. Plankinton			1				
PrA. PrB. Promise	Tatarian bonsysockle, Siberian penahrub, skunkbush summe, lilas.	Russian-dilve, caster res elar, Manchurian crabapple, Hocky Mountain juniper.	1	1			
leA, DeB	Lilac, Tatarian honeysuskie.	Eastern redeedar, Siberian peasbrub, common chokecherry.	Ponderose pine, hossylocust, green ash, Russian-olive, bur oak, hackberry,	Siberium ele			
Rock Outerop.	1			İ			
Sanaare,		1		1			
aRe, Sape Sanmarc.				1			
Ope							
cE. Schamber		1		,			
dP. Su.ly				1			
oc#							
Su. 1 y	Withortan peash-ub. schiktush sumac, stiven buffaloberry; .1 %*.	Ponderdaa pine, disiara e, a K, Millioniara 'a ', " - wastern rejotjar.	iberian cum,	:			
Lowry	Taturian ho eyoung, e, lise	Eastern reledar, for a berry, theretae peastrub.	Purierosa pine, Arce ash, ha kthery, hass i - ive, hass i - ive, has i - bur	Siberian elm			

See footnote at and of table.

Sof name and		442 W . S McG	ca - Mark diesafe	and the same of the	
dab sampo		4-15	1 t = e *	et=44	4 %
ord Sa sy					
амгу	Taractan The suck e.	-aster redcedar,	A tem 50 , Te,  About 4th,  Ab		
(n 4 <b>6</b> ** * * * * *					
Get amb en,					
ak, .48, a	Taranian 	erm o ermy.  Telm o essient  telm a essient	143 47 6 77 ,	E.C. a.d. Mallaman	
Ft, Me ' • · · · · · · · · · · · · · · · · · ·	Tarange reps Kie, ministra perioda Benioda Benioda Liai,	ears no elar,			
o, wp. W entine					

THE R A THE R ATPRES A PRESENCE AND PARTIES OF THE STATE 
<sup>#</sup> See description of the map unit for obspection and behavior characteristics of the map unit.

# TABLE 9. -- RECREATIONAL DEVELOPMENT

.Some terms that learnibe restrictive soi, features are defined to the Lobbary. See test for definitions of "a highly" "To other," and Tenvero." About o of an unley that Bres that the soi, was not rated,

map symbol	any areas	Picn't areas	Patrgrounds	Faths and traise
			-	
Artesian	flooding.	Hoderate: perce alouly.	Hoderate:	laight.
he give	31ight	31 lght	Moderate:	Stight,
solve	511ght	S1 Lght	Severe:	Slight.
ng mg				
eatre	Stight	81 1ght	Moderate:	Slight.
Jera .d	Tezere	Cevera	-ctere	
	es ens avilum.	es con polium,	wa was solium.	envion easily
mira .			1	
Rettpewers	Sovere: slope.	Severe: Blope,	Severe: Slope.	Severe:
AVA	Severe: slope.	Severe:	Severe:	Hoderste:
f	flooding.	(*g) !		Scient.
t a Karrk y			1	
	Severe: Flooding.	Hoderate:	Hoderate; exthese, flooding,	Slight.
harely flowed "	Tooding.	gh*****	Slight	- Alight,
	n err	exerte	544FF	
reek	too winyay.	perce slowly.	perco clouly.	too aleyry.
	t brings. Webla 6 odky	Deres a. w y.	Noderster person slowly.	Slight.
•			,	
gridenna anna N	perce slowly.	Moderate: perce slowly,	Moderate: perm slowly.	Slight.
	Interate.	Y ferate	, M dorate.	M. s.
	peres slowly,	porce story	too clayey,	too olayey.
•		1		
	er can codium.	Severes sodium.	Severe: thoses sodium,	Slight.
	excess sodium.	exace sodium.	Severe:	Severe:
n=				
	depth to rock.	depth to ruck.	strere.	er les masiry.
			depth to rock,	
marra				

TABLE 9 .- RECREATIONAL DEVELOPMENT-Continued

Soil hamm and map symbo.	Camp areas	Pichic areas	P. Aygrounds	Patho and Araca
st Dearey	- Severe escesa sodium,	Severe ercess sodium.	Severe	- itert.
Ели ( п	-   slight-	Slight	Slights	'l ignt.
Jerau.d	Severe excess sodium.	erress sollum.	Severe earces sodius.	Severe entity.
Palmont Daimont	Moderate a.opo.	Noderate slope.	Severe p.ope.	1,1841
Coron	21,8µs	1 tght	711ght	2.13(1.4
. urratein	r cling. watness. percs sinwig.	0x 000 00114m; 0x 000 00114m;	vetnees, perch slowly.	ನಾಳವರ ಹಾಗಾಗಿಗಳು ಕಾರ್ಯವಾಗಿಗಳು
MAR Earl Dannes	- Tight	1	- , _11g :	".143 %.
Dedrey		"evere excess softum.	tevene oxcess andiam	- RF L
Egan	retress, fivoling.	PAYMEN MOTTURE, MECHAN BRAS.	**************************************	, 020FH
Eggs Variant	Severe f noting, weiness.	_ ~ Y ~ T * \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Severe	herites.
'a Farmaworth	froiling, excess souther,	Terres sodium,	್ಕಳಕ್ಕ ಕೂಡ ಕರ್ಕಾರಕ್ಕೆ ಬಾಗುತ್ತಿಯಾಗು	1 items.
Gritys	stope.	stope.	# + + + + + + + + + + + + + + + + + + +	Moderate halps
Jettys	Tevere avope	lovere slope.	Sayana Babbu.	D Breeze
P,A	S. Ight		Sight	Jispat
1x1v4 7, enthal	Slight-	Tight	Molerate	tity ti
Java-	Silght-	S. teht	Voderate	18.5.
gle Righmare	2] [E)/2		Moderate	7.18.15.
Jeva	- 3 1ght	Slight	Bulerate	lautght.
ջու Հրդասու	9.1K* 1	S1 ight	}Moderate:	Slight.
Java	Silght	j.ight	evere slope.	1,500 %

TABLE 9 .- RECREATIONAL SEVELOPMENT-Continued

Soil name and map ayabol	Смар веекя	Ptento areas	Pisygrounis	Faihs and trail:
nAP.			1	
Highmor <del>e</del>	- (S. 1875	S. ght	Moderate:	Slight,
Mobridge-	Tavere Filoding.	'811ght	Hoderate:	Slight.
⊙E	4			
Harvey	ехсени подіца.	Severe: excess sodium.	Savere: ettess sodium.	Slight,
n A P	1	1		
Marsey	vaceba and/um.	Severe: excess sodium.	Severe: excess solium.	Slight,
S.1-kapots.				
5F8				f
JEVE	Hodemate Aluge,	No temphe acupes	Secure Budgets	,Slight,
Betts	** Moderate	Market Age	Tevere File	Slight,
g **				
K. A.	- J. Ight	, 16kt	3.000-	Slight,
			, as open	4
lianhim	- Light-	, <u>tgt</u> !	By pru	Slight.
<del></del>	· Te/ere	Severe	"evere	-1-5-
EDLAB	ponulna.	* ayer,	t ayey,	
	pre a sinely, the hayes	perce samely.	prompt states.	bruging alekt
1	- Cevere	* 4 - 10 0	2 4	
ane	fronting,	1.5	7.1ght	Slight.
*	r			
JETP	Froling.	7.1gh*		Slight.
Paremorth	Severer C sline, excess sodium.	Severe:	Severe:	Slight,
Lowry	* ".1ght-	.1gb*	1.1ght-	or Sitgar
·B	. 2 1-51	0 -1-		
owry	- 321ght	2 Jane	u. '.e	ı'ght.
owry Variant	-15.ight	Sght	ig't	467.
owry Variant	- 4' 18ps	Slight	Mcierate Blops,	Salabti
(cClure	- Suight	Saight	Moderate	181 · .
ic	-   51 ight	-   50 ight	Bevere:	Slight.
14 4 12 1 1			s.ope.	
	1			

TAB E y, -- 9th Boat! MA A P PHENT- optimied

and the same same	1 Chap areas	21nnTo Annau	P. aygre inda	Paths and craise
				1
a	1 1575	1 18 15 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	moderate	Moderate
M'r me	'.1g t	5 ,671	and Severe	M Jerate vo luger
all v <del>viii</del> N s mil ge	Ty - Ing.	1,1671-	Moderate function	t ge t
p.n				
Not of Spinor Commence	Ta Janga	1.lght	Filerate Filerate	.15.1,
Passe of n	and The street	100000	Payere	
	per a allowy	perns sibely	perce slowly,	p rding.
4	7 1865	4.1g*1	Woierate amali stones,	Edward .
1 4 - h ' 4	- !g*t	F, 1gh+	Modernia Talpra EDL : Stores.	fght
(P = E =	tert	S.ig:	'Rodera's	. 1 p 1 2
· · · · · · · · · · · · · · · · · · ·	- Tayang	ezera.	ch wie	b. a H
Spin and the	a se. Imp to took.	terre . ecen.	arge stones, o , r, ie, r r mask	e tes mass y.
(*************************************	1211	1=+.t	an Tolerate	is t.
	M tempte	T ierate	Videnate	M sera e
7-1	er s s way,	ser s a, wig	h yez.	t byr/
	A M. erate	A 71-6	***	*
11	1	property,	i. ţ÷,	सर्वात सर्वाटच स्त्राती ह
Raaaaaa	m W tarter	V Jergie	W Jerate	w jerute
bg	to shirt.	ser a s wilk	t reyer; test to e	1 .4/*).
erbaner by				
K	· 6	- 3/ 1	Moderate and the second	51 Lght.
Fig. 1	- tgtr	2 <sup>k.</sup> ?	Torate	Alight.
, P. 4				
1	2. 60.	P incafe e. pe.	a pro	Slight.
'r d ** = f	s per	a serie		Moderate alope,

Tee for the terminal first in

TABLE 9. -- HEL HEATINGAL DE VELS PHINT-- Continued

Soil name and map symbol	Camp areas	Plonic areas	Panygraunth	Paths and trains
	Jevere	Severe	Kerere	
Pasakinton	pending, perce slowly.	ponding, perce slowly.	percs alowly.	severe se ling
Pr mise	Boderate per m m.owiy.	Moderate to diayey, perce si w.y.	Mederate too mlayey, perce slowly.	Muderate voortaayey
rB Promise	Noderate. perca slowly.	Moderate  * > crayey.  percs s.ve.y.	Moderate  1. ), o.  1.   clayey,  pur = d./r.y.	Enlorate to sayey.
Rao	311ght	- Slight	1, taket	3 lg t,
Rec	Alight	511got	Hiderare	7 istt.
Hork outerop.				
Sandare	Severe * 'ir. lepth to rock.	Tevere a tpe, depth to rock	Severe a fr. dept. to rock.	'ever- n, e, erska camizy.
a F S		1	1 mil 1 mil 1 mil 1	ention custry.
Shraketerson	Severe a. pe. depth to rock.	Severa  s. pe, depth to rock.	Severe  s in.  1-ut/, to roce,	revers erodes essily.
npm1	Sevore E.opa.	Severe	ੈਦਵਾਦ ਰਵ-ਮੁਵ-	Severs. Brodus enaily.
a pre				
Saraano	Severe supe, depth to rock.	Severe 82 pe, depth to room.	Severe: Plope, depth to rock.	Severe slope, erodes easily,
Ope I	Severe m, ope,	Severe	Severe: alope.	Severe Perulas saally.
Soliam er	Severe	avere.	Severe:	Poderate aurps
Sully	Severe B. Ope.	Savera 3.0ps.	Severe: mlope.	evere c. cr.os camily.
50.16	T. Caleto	- Shintt-		
-3223	1160	Sigre-	o. her	, 5.2656.
oury	S. ight	1 1E2:	- ተቀላ፣ 6	Baugita
F*				
30, 3 y	Severe s. pe.	Severe	Savere s. pe.	Severe enbly,
ORCH	Moderate diope.	Noderate E. pc	Severa	islight.
120,				
Sully	Moderate s ope.	Noderate a ope.	Syvere 3. 4c.	Severe essily.

TABLE 9 .- - RECREATIONAL DEVELOPMENT -- Continued

to a mane and may system	Temp wrees	Picer areas	h also file	±' • & s' ' ' t q :
g. ↓ p. ∴ambet	evete a per	2 K.	n	Not rate
y	*gbt	£2.1-1	A - 21 *	
y	* ight	M: t	- Wedrews	-6"
y .	.ight	tgbf	Dgef	3 pt - 7
Ye ste	**************************************	M lera'e	M - 82	M - F,/*
Wes 1'r	Conductor of a	1. but v a	R u-	1 4.
o, Wy	revece	Separate part of the part of t	, , ,	

<sup>#</sup> Saw learnty the of the may unit for imagestria and weather and or also for appropriate

TABLE 10 .- WILDLIPE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and	Fotertia, f r habitat ciomenta								
met mikalyor	Grain and seed grops	Acades and legunes	Wild herbäsesus plants	Hardwood tress	Con'ferous plants	Wetland planta	The Low Mater areas		
Artesian	Pair	Jood	Pair	lood	Very poor	Poor	Poor,		
Pend.e	Fair	Pair	Good	Fair	Very poor	Very poor	Very poor.		
resise	Poor	Pair	Good	FAIR	Very poor	Very poor	very poor.		
PLAT CI B									
Peni o	Pa:r	Pair	Jood	Pair	Very poor	Very poor	Very poor.		
Term , 4	Very poor	Very poor	₽0. P	Poor	very poor	Very poor	Very poor,		
Ampu	10000000	155	77-14-	B					
ict. One	serk hogt	Very poor	Pair	Poor	seny poor	Aarl boot	Very poor.		
Jaya-	(ery poor	Pate	wad	iver	yerk book	Very poor	JARLA DOOL'		
Bon	land	Saod	Fatr	pood	seta book	Nery poor	liery poor.		
800									
For scenionally	Patr	Gond	FRIT	lood	Yery poor	Yery poor	very poor.		
Bon, rarely	1		1	[					
[ -01e1	'Good	Deop	Falr	Lone	fery poor	Very poor	Fery poor.		
la reck	'sery poor	Asta boot	Poor	Poor	Very poor	Very poor	Yery poor.		
'arter	Very poor	Poor	Poor	Poor	Very poor	Very poor	Yery poor.		
751 m	h	•							
E-, (. C	Very poor	Poor	Poor	Poor	Yery poor	Very poor	Very poor.		
Promise	Pate	Fair	lood	Pair	Very poor	Very poor	very poor.		
Cave	D.S. or	Poor	Po r			[			
				Poor	yerk boor	'leng book	Yary poor,		
Jers.,d	(ery poor	, yeah book	Poor	Poer	Very poor	sery poor	Very poor.		
18 DI							1		
tantier	seal book	Very poor	foor	Poor	sary poor	stry poor	sery poor		
Canabarr	Yeny poor	Very poor	Pair	Pour	Yery poor	Very poor	Yery poor.		
Wasey	Pacr	Poor	Prof	Food	1 400 0000		v		
		1			Very poor	very por	Very pase.		
FJerc's re	10 10	1 10 04	lood	1 10 ~d	AMEN DOOL	tery poor	very poor.		
Jersu, d	Very poor	Very poor	Poor	) Po. r	Very poor	Very poor	Yery poor.		
Pelmont	Very poor	Fair	toor	Poor	+ETY poor	sery poor	very poor.		
Dorna	Sand	lood	lood	3000	Very poor	Very poor	Very poor.		
Durratein	sery pare	Prop	Palr	Puch	resy poor	Fair	Pelr.		

TABLE 10 -- A. CUIPP RABITAT--- untitued

	Frential for attitut conserts								
Brain all and	orain and seet arops	indanes	WI d herta equa Isan s	Kariwosi trees	nifer ut plants	Net and June 18	rail w		
				I		1			
Engli	pod	Good	1,003	3000	1 Very poor	Very poor	Very poor.		
Dedroy	700	Poor	Poor	Prar	ieth bont	Very poor	Aeth book		
Eg		Very poor	Pair	100	very poor	, Poor	'FU F		
Egas /artant	ery poor	/ery poor	Palr	Paor	rery poor	Fatr	Patra		
Parasvorth	oor	Poor	hor	Foor	very poor	Yery goor	Very poor.		
Gettys Y	ery poor	Pair	Pair	Poor	very poor	Very boot	Yery poor.		
TeF	ery poor	very poor	Falr	Poor	Very pour	very poor	'very poor.		
On A	isol	Good	book	loot	Very poor	tery pour	very pour.		
Owner J. enhance	Saad	Good	Good	Good	Yery poor	Very poor	Yery poor.		
Java	Fair	Pale	Good	Poor	Tery poor	Yary goor	Yery poor,		
Mighto Pro-		Bood	Good	Good	Very pour	Tery poor	Very poor.		
Java 1		Fair	Good	Poor	Asta boot	Asia boon	Very poor.		
Mighmore	Pair	inod	Food	, n . od	very poor	Very your	prey po ".		
Java	Poor	Teatr	2004	Foor	(ALA book	Jery pour	ery poor		
Highmore	Good	*Solod	bood	wood	very poor	.ary poor	dary post.		
Mobridge	dood	Solod	Pair	3004	.e-y poor	tern bose	, sech be ou		
Hot-	lery poor	Very poor	1000	Poor	Yery pour	Very Mor	sery park		
NoA#:	Jery poor	Tery poer	Poor	Poor	ecry pose	very poor	very poor.		
Slickspoin		]				1			
JPE4-	Very poor	1 Pair	lood	2000	very poor	Tory po r	Very poor		
Botta		FAIT	Fair	foot	ьету росп	sery poor	tuth bore		
Jecs Jecs		Palr	Jood	) 800=	sery poor	reej poor	wery gare		
		Jo od.	* ac nd	Valr	iery pour	very por	hery your		
U_entab	•	Po or	For	2001	very pron	Pair	Fa.r.		
Kolle	Good	Pair	.ao:	1001	resh book	very pour	+ "y pa r		
Lane			4	2					

TABLE 19. -- WILDITPE HABITAT -- Tentioned

P-1	Pitential f c tatitat elementa								
Soll name and map symbol	Train ant	Grasses and regumes	beenare us	Agrimond trees	foniferous plants	Bet and prests	***** * aften		
Lr.		1		1					
Lane	Good	Pair	20.00	iood	bery poor	Very poor	very police		
Formaworth	Poor	Poor	Peor	Foor	remy poor	Very poor	reny polity		
Lowry	Good	13004	30 od	ac od	iery poor	Very poor	sery wor.		
Loury Variant	Pair	Palr	lood	'Toor	Yery pour	Very poor	very pour.		
McC, are	Good	3004	Sand	iood	tery poor	Yery poor	Yery poor.		
MgC	Fair	3000	Poot	13600	very poor	Very poor	fery poor		
MbA, MbB	Pair	Pair	JO 04	V450	very poor	very poor	very p r		
MbC	Peor	Fair	Good	'Pair	freely book	Very pour	very be in		
MoA Kobričke	Good	300d	Pair	30.23	very poor	very poor	Yery past		
Mp*: Hobridge	Good	Soot	Pate	1 1 2 2	(ery poor	very poor	lery v		
Plankinton	Foor	Foor	Poor	ř· ř	ery poor	Pacr	Palm		
(a	Pair	Pair	i0 20	P. 02	sery poor	sech mos	1449 pt 1		
Odfia //khe	Fair	Pair	good .		rety pure	bery war	erry or r		
Delmon'	Poor	Pair	Poor	Faat	very pear	serry pour	rest part		
neF	Yery poor	Very poor	Pale	To graph	very prom	sery wor	100 1 10 10		
Ng h	Patr	Fair	Good	Pate	tery po r	very pure	ve "y" , "		
Çetê:	Patr	1Fair	Soci	rair	er, poor	very pune	rery mor.		
^mr	Poor	Pair	Good	Patr	sery poor	yery pour	rer, p. r		
OpR-	Asta boot	l'ery poor	Poor	Poor	sery po r	vary poor	cery is r.		
Ce. Orthenca	1		1	4	ŧ				
Ott. OtB	Pair	Pair	X003	7005	enty poor	Very poor	Very poor.		
Our## Orton	Very poor	Very poor	Good	F or	tery pour	Very soon	Very poor.		
Schumbor	Tery poor	very poor	! Poor	2000	Very poor	very pour	erry poor.		
Pagneinton	Poor	Foor	'Foor	Post	Yerry pont	Poor	Pa r		

TABLE 10. -- WILDLIFE HABITAT -- Continued

\$ 11 mam= and			Potentia	i f r tabila	r Frederica		1
mbr dyn:	reas and seed sops	grantes grantes	ter a coas	trees trees	PLENCE IN	Wether! proble	Ta. We water areas
Pri, +FB	ha r	Yair 1	bood	Pair	'very poor	rety poor	fory poor.
Red, Selin.	্চ ব	1000	Good	, 30 od	Very pour	yery pose	sech No c
Rock outcrop.							
Sarahre	very post	Treny poor	Phir	Poor	Very Jase	orna y r	eary part.
·U. Sfl	sery poor	) wery pore	FATT	Per	Very poor	ery pro	tery poor,
'F3	very poor	'Pair	hood	00	Yary poor	very poor	Avea book!
Saper	Very boor	rery por	rn.1=	Poor	Very par	cent tope	very pain,
1,th	Yery wor	Very poor	Frod	Pa e	Mery poor	sery po r	deny polin.
6 H74 P.C	cery poor	tery poor	Pron	Pour	tery por	Zery ye c	very pour,
	Zery poor	Freny soon	Pair	Pior	yery pour	Zery b T	iery po r.
	Foor	Pale	Fate	Foor	Very poor	Very poor	Yery pour,
Abary	Fatr	Good	Good	Pair	Very poor	Yery poor	Yery poor.
. Y	Yery poor	Pair	Pair	Pour	Very poor	Very pour	Very poor.
wry · ·	Foor	Good	Good	Pair	Very poor	Very poor	Very poor.
48 E B	Yery poor	Fair	Patr	Poor	Yery poor	Yery poor	Very poor,
1 Pamber	tery poor	Yery poor	Poor	7007	Feel Book	Teny phan	yery poor.
#4, gamere ver	Good	Good	Good	Good	Yery poor	Very poor	Very poor.
P)	Palr	Good	Good	Fair	Very poor	Very poor	Very poor.
Wandte	Pate	Pate	fntr	Pair	Poor	ery por	enty person
Wendle	Poor	Pair	Falr	Pair	Very poor	Very poor	Very poor.
Worthing	Very poor	Foor	Pair	Poor	Yery poor	Good	Good.
*prebing	Very poor	Very poor	Yery poor	Poor	Yery poor	Sood	Good.

we inscription of the map unit for a myosytion and be avior characteristics of the map unit.

## TABLE 11 .- BUILDING SITE DEVELOPMENT

[Same terms that fearethe restrictive moti features are defined to the 2. samey. See test for definitions of "maig t," "molerate," and "se ere." A set of far entry of 8 or hear the moti mad not make in the feature of the onaite investigation.

[Same terms that fearethe restriction of the 2. same for the 3. same for t

Soil name and map symbol	Sharra excavations	Dwellings with a basements	we tage with besenante	econor far built ga	to a road: the atrest:
	1				
Artestan	tro nyey. methens.	foreme folias, and instance.	Severe: flooding. abrink-swell.	Severe: flooding, abri weavell.	Severe: low strength, Abrins-ass.,
Beslie	'Moderate 100 clayer.	Severe Shr na-586;	Noderate: shrink-swell,	Severe: shrink-swell,	Severe shrink-swell, low strength.
ggg e		4			
Bead te	Noderate too Layey.	Severe ahrink-swell.	M. terate shrink-swell.	Severe shrink-swell,	Severa. shrink-awell. low strength.
Jerauld	Moderate	Severe	evere	Severe	
	tod ". Ryey	f string-swe	stry Weampare	B First-Betain	s rice swell, low strength.
<b>司</b> 罗·		1			
Rett see	Severe alope.	Severe 1. pe.	Sevente Bidge	Severo	Severe "'e strengte, A. spe.
Jhva	Severe s.ope	Sovere s pr.	ferene #. pe	21.354 -	erere . e strength, #lope,
Ban	Glight-	F. OZ* 1g.	Severe firestag	Total	'F derate . a p or gth. facultag,
					frost action.
os Boo, occasionally	1			1	
floodes	Severe We'heds.	Severe: flooding.	Severe: flooting, welless.	Severe: fincitng.	f %. front action.
Bon, racely		1			
f.001ed	S ight-	Severe- flooding.	Sevare: flooding.	Severe: flooding.	Priente Windength, fin ling, fruit arting,
	Molera e	1Severe	Terre		
Bulle Peek	roc layey.	14-14-9-4"	# 11 K-1WF	e rink-swell,	acycre . w locagio, diles sem
	Midemate	Severe	evece	Sriere	Corre
arter	toc c.ayey.	Sh-fra-Swgia.	Strick-Swell-	armina one	n ri s-sen. low strength.
d					
BETAC	Noterate to layey.	Secrete as h ru vawes,	B C. CK-SMC	2 CASHGY CASHGA	o strength.
rom: se	*cderate to player.	Spinged derra	Tevere dering twee,	evere a r k-swell.	ar V-serial
ell y					low strength.
	Wojerate	Ho leeste	Mark Care	Wolmeste	

<sup>15</sup> 、 <sup>1</sup> 、 九春秋色 用竹莲	Th 8 4 W	700 .40	We "TU/S	p <sup>(m)</sup> =1	ca rais
map symbo.	ercavations	W	4	e - 44	and street
	1	1200001	13: 07:13	+ 2	
-4 , r f 6 u , d	M. tarrata	Teantr			
0F1 #17 7	o c stel	N L. N-SMETT	5 - Lesse	a sair .	<ul><li>おとのできる。</li><li>おとの対象</li><li>まとの対象</li><li>また。</li><li>また。</li><li>また。</li></ul>
p. •					
hantler		Carlo Pro	"e-ere	Pr. pr. Pr. pr	) eTe
	ley h to mode.	3 P. A. INC	STOKENS.	6 *** 5 ** C * . *	\$ 100 mm
'anaarc	Can make	7 = 4 + -4	Ayere	man to the second	Severe
	ingth to rest.	ar, weame.	to, to a	で 。 さて キャルビデュ	strink-eveli los strongth
n 4.4					
with interest	* washe	p gn.	M garge g	,	Severe:
	by Syer	3' - z 3ve	3 M /- WC.	4 4441	low strength
					anrink-awall
- ak , n	S. 15.55	. Vijamita	Mare him	Ve sy te	Severe
		Gal. Rebate 17	D. F. & 146	E - Lander	low strength
ferauld	* merate	exere	77.00	****	6 .16
	tuo ayry.	Star ( E-BME.	t n 's see	p K-amera,	20 E p 150 M at 1 Endings 6 In
	Severe	*Voderate	Nimerane	- erece	V res e
TO 30.05	ittanca cave.	Surpre-	2	t	3
	Multiplication	" pr provide	ce, pre	e er	evere
L. Prb	tho chayey.	なた。これを一貫関係をよっ	of ingrase .	1 - C - Na - 2 - C +	a to the p
,	6,000	Terre	epens.	ezere	4 60 75
Hummorely	welleeds.	21 TA - 5 AF - 4 A	in the	· 6.	r a
		wereas.	#6.3 5.20 2 V Ru A	#	ker dag
5.8.9					
25 K & There	1,00		56 ma = 4 m	P Serie	R.C. Atle
		abofra-live to	d fi x-rde	2 4 EME .	was respict.
belong		- invere	Williamsty		40.000 (20.00)
	t . nyey	ST CTAL BOOK 4	3 7 3-2002	n a swe	7 "L113 - 3 = C 1 L .
		Tevere	former-	and the second	* * PH
kga a	we ness.	1174.	1 16	100	# 1 respt
	,	71 K-1866	2 - Y-184	e sec	1 + 4-
	10 000	Severe	S. pp. m	er p	. 50
Gras Perlant	per ung	flooding.	1 4	4,	+ 11-47
		ponding,	5 P >= - M4"	4 m 4:	1 .
	Moderate:	eynee	÷ +=+		
furnmenth	too clayey,	F & .	r ==	flooding,	to the second
	weiness.	310 12-3-6-7-	Book Million	shrink-swell.	w wat because
et, Gar	Severe.	0×800		Severe.	par Jili pa
Inttyo	alope,	1 C 349 .	5 0 0 000	A = 3 =	
		F	E C SHOWS .	2 x 0 (00 x	
		10 4			éstan ,

TABLE 11 .- BUILDING SITE DEVELOPMENT -- Continued

Soil mame and map symbol	Phaulow escavations	Pwe, ings without becomests	Dwe.lings with basements	conquerial puillings	and otreets
					1
kB#. 1.enham	S. ight	Moderate abrink-avell.	Maderate ohrink-swell.	# per nk-sagra, Wedelpte	Severe
Jevė	is ight-	Mojerate shrink-pwell.	Moderate anrink-awell.	Moderato histikeamela, a. )pra	levere low strength.
gbe Highadra	Slight	Moderate; shrink-seeil.	1Koderate mirink-menia	Milenate Bhetesismesai	Low strongth
Jovanne	- Slight	Moderate shrink-swell.	Moderate shrink-avell.	Majerate abrink-swell.	low strongth.
iges Higgsparess	Sight	Moderate abring-seedl.	Moderate Moderate	M impate minideseri, miope.	TOM BILGURES
Java.	- 51 tabt	- Yoderate.	Moderate shrink-swell.	Roderate shrink-awalls slope.	low attength.
Hall Marketon	- Naight	-: Moderate apri: M-awel: .	Sitent	Moderate at risk-awail.	Severe year strength.
Motolige	- Maderate flooding.	Savera Freeding.	farere farouing.	Severe frooding.	Severe .or strength, fluoding.
Ном	too clayer, depth to rock.	Severe angina-awalan	Severe	Severe arring-hadest.	Severe Err ng-amera Low strength
нале - к лексупшина полити	too clayer, depth to rock.	Severe	Service Service	during-dept.	Severe a fine-saction atrength.
"linkspots,					
1616 wo / 5	Moderate:	Moderato shrink-avell, alope.	Noterate. slope, shrink-swell.	slope.	oevere .om strength.
()e+t3++	Moderate As pe	N terate shrink-swell; alope.	% locate arose, phrink-small.	Severe sicps.	TOR OTHERSTY
JgC#		Milerale piclus-aseli.	Roderste She ok ambi:	M incrie ort k-sec., slope.	Severe
() , m (q?) (q m →	Y, ight	Moderate shrink-swell.	Roderate.	Mulerate mbrink-neell, slope.	low strongth
Ko	- Severe	Severe	(Savero	on indexes	. everd
K Sala	pressing	ponities.	p. n.ling.	pond_ng	ponding.

TABLE 11 .-- SUILDING SITE DEVELOPMENT -- Continued

Sol, name and	ds: syntion ds: syntion	Owes,ings w. host basene ta	Dwe. ings with basements	bulldings	Who appears
[Ane	Foderate   top tanyer	Severe: flooding, arrick-swell.	Severe: flooding, abr'sk-swel,	Severe: flooding. shrank-aweal	Severe: low stronger, arring-ame.;
re Lan <del>e</del>	Roderate too c ayey.	Saveres flooding, phrinq-pwell.	Severe: floading, sngink-ase.),	Sovere: flooding, shrink-skell	Severe: los strencti, stringenti
Parmadorth————	to larger, to layer, wellook	Severe: Flooding, strine-sweal.	Severer flooding, strink-swell,	Severe: flooding, shrink-secie.	Severe low at rengin, profit k-aser
os -	**! Ignt	Slight	Slight-	Slight	Moderate: frost motion, low strongth.
oB	7.ight	Slight	2.tght-	Maderate d. pe.	Noterate for the two, low strongth.
en	Severe cuthanks tave.	311ght	5,1g3(t-	1-114611	- N termin frost motion.
towny Verlant	Severe cutoanas cave.	31 ight	511ght-	Moderate:	Noderate frost action.
Mr. C. see	Roderate too rinyey,	Severe: shrink-avell.	Savere: shrink-swell.	Severe: ahrink-swell.	Severe: Shrink-avell, low strength.
Miniboro	Roderate too camyeg,	Severe: shrink-swell.	Severe: ebrink-swell.	Severe: shrink-swell.	Savere: shrink-swell, low strength.
ca	Frierate frooding.	Serere: flooding.	Severe. flooding.	Severe: flooding.	Sovere: low attempts, flooding.
p <sup>*</sup> Mobridge	Moisrate f.odjing.	Severe: flooding.	Sovere ficiling.	isevere Localne.	evere
Flankinton	Severe: ponding.	Severe: ponding, photos-par,	Savere profits, atcinioners,	Severa per ing. a lina-seril.	tevere productable shrunk-adeli
0she	Severe: outbanks cave.	Slight	S. Lght	ight	w satgets
dB <sup>4</sup>					
By Description	Tevere outbanks cave.	stight	211698	Moderate   Blope.	2.1g2.52
Delmont	Severe: cutbanks cave.	Slight	al ight	Moderate:	Slight.
Wh ton	Severe depth to rock, elops,	#lope.	depth to reak,	Severe #AGPR+	iow strongt.
NO NO	Moderate 'oo clayey.	sering-syel	jevere ohrink dwe	a cing-quels.	7 . Tr . = 3 rule r. 51*1 :s=5#2:

TABLE 11 .-- BUILDING SITE DEVELOPMENT -- Continued

Sot, rame and	SPALLOW DECAVATIONS	Dweings	Dum , ogs	Small contents, but illust	the process
opal	Hoderate: too clayey, depth to rock,	1Severe. abrink-swell.	Severe shrink-awell.	fevere abstracesers.	Severe shrink-neell, low strongth.
Cpsi	Moderate *- Clayey, depth to rock, 8.ope,	Severe shrink-smell,	Sovere ahrink-awell.	servers servers shring-prol <sub>i</sub>	Severe
Light and an annual and an	Severe depth to rank.	Severe ahring-swell.	Severe depth to rook, shrink-swell.	ervere Abrina awell,	Severe. low mireogith, shrink-aweil.
r. Orthenta			1		
t <u>i</u> Orton	Severe: outbanks cave.	9, 1gr t	5light	- 5 lght	5light.
Crion	Severe: sutbanks save.	Sight	- faight	Moderate al pay	Slight.
wg II		1			
:T 1 6 D= ================================	Severe Cutbanka cave.	Enderate suope.	Moderate	Tevere a upo.	Moderate #lope.
Schamber	fevere s. pt. cuibanks cave.	devore alope.	Severe d. pc,	'severe	Severe. #lope.
L	SEVERE	Severe	Severe	Severe	Severe
Plankinton	ponding,	product as a month of the second as	shrink swel.	enrink-awers.	ponding, shrink-swell.
rA, PrB Promise	Moderate Luo ciayey	Severe shring-sweil.	Severe 'shrink-awell.	evere a rink-Adeis,	Severe shrink-swell, low strength.
Pa e	*.ight	Moderate ahrins-awe.1.	S. 1ght	Majerate a rink-see	Sovere low atrangth.
èB	Slight	Moderate shrink-swell,	32187-8-	Molerate  1 pt, Shr.DK-sweil,	Severe low atrangth.
Rock autorap.					
Sanaare	Severe: mlope, depth to rock.	Severe plupe, she name	Severe  s or, s rirk awear, tepth to rock.	Severe alope, abrink-swell.	Severe S are avell, as about
ER C-TAR				1	24 2 10 10
entants	Severe	Severe	Severe	Sovere.	e.cre
	depth to rock.	string-ample	drains-swell, dept to rock	shrink-avell.	a first swa
Opm1	Sowere Subpe	Severa or pro- or trice over 1	Severe alope, string+Ewe	Severs slope, shrink-awell,	evere s. pr, a. (ink-ner l, los strength.
Schaaber	Severe slope, cutbanks egve.	Severe	Bavere alope.	Severer alopa.	Severe: alope,

out syst .	754 1W	.we inga wi . car ce is	#	en A las La C <u>A</u> d	H 7 3 5
у у	a myer.	2 \$c.	favere s. pr.	a e,	Severe alope.
r ^#					
	12**	Z#*	1470	- M immate	From Setion, low strength.
£H=Y	1,12***********************************	[KF5	1 1gh*+ ·	P jorate	Marane .
. 0		4			
у		-V+	- y - r -	- 1 - F	1 + +
	fi part a	9 p <sup>m</sup> =	3 200	2 F-44	1.41
F MTy	FM being hig	Fig	W. gwente	Sec. P. Sec. Say Say	þ
	A	4	A mana .	3 75	1
. 3		W Theate	Avanuage	of the	P ccs
	* 10	* , e .	3 , e	10	м г
"c" 225 =	FJECE	0.000	0.00	* **	" "
	1 . 15 K 2 *479 .	\$ -5e	d yet	2 7 .	Hillian .
2	121	E. :	. 181/1	'6 '	and the state of
,	12"	2	. L' in 1	1 -	A LANTE .
1	Mindagegre	met ere	0.000	0-075	A P. T.A
no to	a yey	structure,	ALT K-SHO	NBB	low atrungth, abring-avell.
		ie nee	evene		Severe
en le	1 2. 1747	* /=54+++,	e stage	Ta RYTHA FA	shrink-swell, low strength, flooding,
	200	exe o	4 250	Tellere	Severe
* **	× 14.	profession .	p J. Mag	s size.	iow strength, ponding, frost action.

<sup>4</sup> Ten ind militar of the map unit for demposition and persytor chara terist's of the map unit.

## TABLE 12, -- SANITARY PACILITIES

Some forms that features restrictive soil features are infined in the 3. manny. See feat for infiniti ra of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information is this table indicates the Jupicant soil consittion, it was not estimate the need for ensite investigation]

Sol, name and map symbo.	Septic tack absorption fields	Sewage lagoer areas	Trent, perilary latifical	Area danitary is 161.	For landfill
Ar	Severe	1421			
Artestan	peros slowly,	Slight	too clayer.	Sovere Weisless.	hard to pack.
3e7	Severe	Hoderate	Severe	111ght	(p
Bendie	perce alowly.	A.ope.	too clayey.	14 18	hard to pack.
Per	Bevere	Severe	evere	15. tght	- Food
[[产队]]	perce s owly.	stobe.	t o crayey		hard to pack.
Reg B® ±					
Readle	percs slowly.	Moderate alope.	Severe too clayey.	1ght-	the clayey, hard to pack.
Jerauld	Same	Slight-		1-24-2-	
	perce slowly.	ari inv	Severe: too clayer, excess sodium,	811ght-	t. ayey, hard to pack, excess modium.
Dog [/** :				,	
Betts-	Severe	Severe	Severe	Tovere	P- pr
	penta slowia,	Hx Tpe.	alope.	5 pe,	n. Spe.
Javavenness	Severe per a slowly, stope,	Severe acope.	Severe: slops.	Severe: alope,	Poor:
in	Moterate	Severe		44	
Fon	frooting, peros slowly,	verbule.	Severe:	Moderate: Flooding.	Good.
80*1					
Bon, occasionally	1				
flooded	Savere: flooding, methesm.	sectors and then sectors	Terrera Terrera anderse Vertonas	r ding. met.era.	· 医克尔特斯 ·
Bon, parely flooded	Moderate: flooding, perca slowly,	Severe scepage.	powhake.	Modernite From 21 ig.	, 204,
lu	i Savana i	Modernte			
Bullarent	perca alowly.		to syey.	J. 1g <sup>1</sup> · t	to clayey,
Carter	Bevore: perca slowly.	S.ight:	ievere two .aye,.	S. lget	or trayey,
p.0					
Carter	Severe percs storty.	51 ight	Topere too 1 ayey.	51 Lgnt	there are a server of the serv
Promine	Severe	Slight	50 cars	. 1 whi	
	perca clowly,	1	too misyey.	o.ight	hari akk.

	· .	'			
est, hammand	2 7 2 2	2 - 2 · 2 · 2 · 2 · 2 · 2 · 2 · 2 · 2 ·	4	,	, ) , v. t
_			- A	•	-
48					
CAVO	perce slowly.	Slight-	-  Severut	]51 1ght	* * * * * * * * * * * * * * * * * * *
Jersuló	- Severe: percs slowly.	\$1 lght	Severe: 1 too clayey, ercess sodium.	191 feus	~
*5*					
antler	depth to rock,	depth to rock,	depth to rock.	depth to rock.	e e ate
/Et 02[	depth to rock,	slope, depth to rock.	depth to rock.	depth to rock,	
nab DeGrey	-[Severe: perce alouly.	5) 1ght	-  Severe:	51 1 <u>825</u>	CLPS C
Fakto-	- Severe. perce slowly.	\$2 t=w		γ	
Jerauld		12 1220000			- 43 
- 6	1 few me				
Delmont	poor filter.	5 P 40 -		п у хр.	
, beil	vent sure /	30 - 4×c		p	^ '/.
Name of the control o	er er er er er er er er er er er er er er er er er er er	ght assessed	a a a	H	N . 1 4 4
111					
19.2 th	pr 5 3 4 y.	2.5	V	,	3,775 5 1
(v/3re)	per p sl way	X2.1	· - ·	,	7 24
g	e not f e. weiness pens in newy.	esnon r ess setness		ender c	ar intr
Eggs Variati	r cz,	The second secon	Forete	b	, . r . Yey,
1		~ 25.7	2/09.	w w p	4,8,,

See footnote at end of table.

TAPUS LZu+-MANIJARY FA ... Tibu-- continued

Not tabe and	Septic tank transporter fielsa	2cmage Ago 25 acess	Trenth mar fary at f	Area sqr Tary a off	Daily cover for landfill
M		1	5		l n
Apr. Ach		e ere	le ere	evere	Foor
361.38	S. (*.	at her	3 ,e.	aloper.	ayey.
	4. 10.	1	in rayey.		fant jack,
	1				
71 4	levere	* * * * * * * * * * * * * * * * * * *		1 11g1:	
,,=r; AD	has a growth.		t ayey.		the Crayon.
ple of the					
A SAMPLE	Saya e	NW Kamara	# "# = # = # = #	, 1 g h*	-   Pair
	l per a sinwiy.	a pr.	inc .ajey.		too clayey.
7.0 . 6	l Sacres	V terate	W tone o	1.1.11	Pala
78 / 8	yer a sitting.	Servado,	A June u	1,1811	
		9			loo clayey.
4p.m#					
h grmore	Severe	Moderate	15.1g-1	*gb:	- lood.
	per a avenuy	30 . SPE.			
		A pro-			
Java	Severe	V demare	Min emails		Pa n
	per s sion./-	beriker.	- 35CY.	6	too cleyey.
		a per	23.71		
12 0					
· g'ak-re	exect	W terate	F * g * 1 +	*light	- 3003
	yer a dinery.	anns san.		1.0	
		1 - 5 C -			
reve	Sayare	Pesere	W tengta	.1ght	Parr
	per a sioniy.	1 pe	to clayey.		too c ayey.
ty an re	3.10	Writera e		7717 7	20.00
E - L	7.16 *	3 24	* 16.	Dig tossesses	-   Gr ->-d
		sce, a.c.			
M -14					
W Lilkannen		Southann.	7.1 /3.1%	evere For Alma	Pair
	fir ling,	er z i mente. *	A 194 B	Fic fing.	too clayey.
foll—————Boi	Severe.	evere	Severe.	"every	Pr
Rurley	perce alouly,	te, tr to rois	depth to rock,	de, to to he k.	area rectain,
	depth to rock.		excess sodium;		Barris To place,
			too clayey.		ex eas and, in.
n A f					
42" egannana	to the same	- p-e	Savera	ecese	Pone
	per a minwiy,	r, th hi fork	depth ' ' K.	Be, th to roll,	area rec alm,
	des him inside		ot was a flum,		caccia saulum.
7 1 main to					
and the					
Tre P				1	I .
5 7	<b>可以开发中</b>	Severe.	Answer: Fe	Moderatez	Fair:
	per a al way.	slope.	3 yell 5	alope,	too olayey,
			1 - Layey.	]	slope.
Berts	Severe	Sevace	Mage-ate	Moderates	Patr:
	percs slowly.	slope.	5 20.	alope.	slope.
eC#					1
Jarannessen	Severe -	Severe	Wo meate	31 ight	- Pates
	persa alouly.	Alope,	5 420%		too clayey.

TARGE 12. -- CANTTARY PAC .ITTES -- Continued

Soil name and map symtic	ata option folia	Sewage Lagoun	Gar' Ary	Area as hary and a	fr adri.
			1		
ig 14					
). enhan	levere	evere	"F fechie	. 1 g h*	Pair
	JAP 6 5, 8.9.	8. 1/6.	' o .ajey.		5 5yey.
(D	1Severe	S. ignt		primer	PP
Ko. A	yer's slow,y.		ayey,	annaine.	33577
	, e n 1° ng		ALC: NO		an the
b	Sweete	* grs		M. Jerahe	150 -
Lane.	pen a alouty		* 10 1 4949.	f. ring.	2324,
					or pac di
ra .					1
P204		.1gh*		F terate	P. P.
	peraacuty.		too Ayey.	Licuits.	rams to pack
Parmauncth	Severe	ferere	Severe	jevere	ir r
	per e e owly.	weiness.	'r ' lyey,	Westons.	to cayey.
	Wethers.		met ear,		, m + 0 4
			ex ess sodium.		THE PERSON ASSESSED.
oA	Stight	♥ .te-ate	2.1612	- Light	2004.
[GETY		serpage.			
oB	in ten	Woderate	1311g-1	- Light	word,
Lowry		3 2 7 1			
		arepage.			
vA. [vB	laves	Tevere	(cevere	1 cycre	2.0d.
Lawry Verient	poor firer.	seepage.	sectage.	Servage.	2300.
E !	Sevure	Moderate	Se ore		Pour.
Mo Line	perce blowly.	B zpe "	to conjey.		ton clayey,
				r	hard to pack
e.c	I Formata I	Severe		izht	Poor
McCluro	perca elowly.	3. 00:	tio agey.	12 28 100	t Layey,
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			•	an t wack
b.k	Severe:	5.1ght	-1 exere	11gh	Poor
Hillboro	percs slowly.	į.	too cayey.		The Chargest
				1	hair to posts
bB	Severu:	Moderate	fevere	. ight	P. 18
Miliboro	perce alowly.	8. 20.	too Clayey.	25,000	* * %/8/
	britan ara-ray		1.0 2.1,0,0	1	rapet to park
b C	(Serure:	Tevere	Levere	3112Ft	Pare
Killborn	percs slowly.	a pe,	to clayey.		*
					THEFT - PER K
o.t.———————	- Severe:	Waterate	evere	-04000	)Pair
Nobeldge	flooding.	医光光头 化成形头	r sing.	I SETTE	* " " " " " " " " " " " " " " " " " " "
h.		l .			
Mobelige	Tayere	Thinnate	'e ore	evere	Pate
	file ding.	seepage.	fil ding.	f. ling.	for clayer
Plankinton	· `evere	5-ight	- fevere	·evere	Poor
				paral 8-	too clayey.
	A SA TAMES		t negetie	by a na shi n	hard to pack

TABLE 12 .- SANITARY FACILITIES -- Continued

Soil mame and map symbo.	Septic tank absorption fields	Sewage lagoon areas	Trench au-frany landfill	Area san'tory landfil.	baily cover for laberily
Oahe	Door filter.	Severa: scopage.	Severe: scopego, too sandy.	Severe:	foot ser, ase s s s nes, tou sandy.
3d94	•			h .	
Cmhe	par fiter.	Severe scepage.	Severe act, ago, too sandy.	Serece Heepage,	For page, sto. Page, too sandy.
Delmont	Severe: poor filter.	Severa: exepage,	Severe: seepage, too sandy,		programme, attent, are aken, the sandy.
- P	Severe:	Severe	PARK.	Severe	p r
Olon tous	depth to rock,	depth to rock, slope,	depth to rock,	rejor to rock,	nama to .a.k.
127	Severez	Moderate:	Severe.	S. 1g/ t	- foor
1 KO	perce slowly.	s.ope.	too riayey		hard we ark.
mB Opel	Peros slowly, depth to rock.	Severe: depth to rock,	Severe: dapth to rock.	severe sepit to rock.	Tock mean recurring hert classes
c pai	Severe perce slowly, depth to rock.	Severe s ope, depth to rook.	Severe depth to rock.	Severe legal to rock.	arra re sa a. hari to sa k.
p <u>B</u>	Severe: depth to rock	Severe; lepth to rack.	Severe:   Sett to rock,   tractage;	Severe.	For area re aim, to injury, and to pak,
r. Orthenta	1		1		
rl ork	Panaga	F 11 - 2 - 41			
th, Otherwood	poor filter	Severe deephge.	too sandy.	प्राच्यक्ति = प्राच्यक्ति =	is r seringe, the solin, spa, stes,
w E.					
Crton-	Severe poor filter.	Severe mespage, m.ope.	levere amepage, to savidy.	ecabais.	torpage, total y. span. of dos.
Schader	davera: slope poor filter,	Severe: elupe, seepage.	Severe: slope, sampage, too mandy,	Severe: slope; scepage;	and a binder, despite and a series of the se
d	'Severe	S. igrt	+ Severe	13evere	* nr
Planeinton	peres slowly,		punding, too slayry.	gonding	nel park, positing.
r1	Severe	5,1gbt	- Severe	Saighte	- Kage
Promine	beccm wroath		foo stalel.	24 1Kirtanaaaaa	hard to pack.

Tak F 12,--SANSTARY FATE . TIES--Continued

Politicame and map ayerox	and option finish	Sewage lagrum	Transfi sati any sati a	Area mar tary latiful	Daily cover for landfill
					1
Principe	ter a stoath	Vode-ate	Severe .ayey.	lgf:	arey,
Tone	Mintengre Jerra sysk yy	Yrdeekhe	. + \$6 a	1901	
ince	per a slowly.	terate 1 .e. 2cc, 2cc.	1, 1611	:gh:	1
es k syttems					f
SHORE CO.	- Fierer	Pernse	Perere	*****	Fr
	ie," to ro e.	lesso so mine.	ter " 's rock.	lepth to rock.	area rec a m,
(4×6) 496					
Sar shirt annual annual	m my mitch	Triese	The prop	2 Y 10 F 10	P =
	leg h to mark.	le, t to rice,	ingir to rock.	in, in to even	del to para
pa	2 p 4 p	e i e e e	evene	exere	g
	real to the factor in	ie, " in reck.	in, a to rook,	(e, 15 ) rock	area ee area
	- 34955C	evere	5.5.5	cycro	i- p
r saher	, For ser.	a frage.	der syn non sa dy.	5 cc, 43c.	10 7 1 210 EA
dF	-! Severe:	Terere	Centre	02078	p +
Sully	alope.	a. pa.	B Life.	n pan .	2 15
Sully	- Slight-	s. pe.	r ig t-	1 · g / 5 · · · · · · · · · · · · · · · · · ·	
LOWEY	- Slight	) ) r	* * 5 * * * * * * * * * * * * * * * * *	- lights - scale	. , 4
C 6					
3 y	Elope.	a Ler	9x -4 T.	5 to	P r
Lowry	- Moderate slope.	2	W demale	P SPESSO	24.242
age.	,				
Sully	- Roderate:	ender = ender	Historiate du per	r yr.	, ., e,
Schenbergeren	alope, poor filter.	5 , 1 , 2 = 7 , 4 , 4 ,	TO THE STATE OF TH	67077 5	7 d 6 35503,
hA-	- Slight-	本 等 かかが出り色 3かか。4歳と	r tg+t	isht	as 1.
the B-	- 3light-	or , wr.	. 15** ·····	***************************************	1.03

TABLE .2 -- SANITARY PARTLY ES--Tontinged

Soil hame and map symbol	Septin tank abs option fle,ia	Swedt .agoon areas	Trench sh' ary	Area am fary ar f	for unlified
Ja T	Sitant	Severe suspe	* * ight	lg=1	1001,
Wendte	Severe perce scowly.	S.ight	evere .ayey.	Muderate figuring:	Por Cayey, Family, pack
Wendte	Severe pro a minery, fr oding.	Corere Funding.	levere ' .e/ey, f. d'ng.	evere flouring.	f r layey, tard to pack.
Worthing	pending.	5.2gh?	South Arry, sond of	Server- sk naing.	nar ryaddy nar ryaddy
· F	devere productions, ponding,	revere ponding.	Severe * wyey; parafra	Tayera po GINE	P P C.EYOY, TACK, DOWN NO.

A See description of the map unit for composition and belavior characterist ca of the map unit.

#### TABLE 13 .-- CONSTRUCTION MATERIALS

Some terms that lescribe mentricitive soil features are defined in the subsecty were trul in set into a figure," and other terms. The first resulting to see he'd as a work mutal. The information is this table indicates the dominant of a confit multiple terms to be single the dominant of a confit multiple terms that the minute the meet for chaite investigation.

Set, name and	Hondfi	fand	at det	7 25 14
	-			
Artesian	Pour low strangth, shrink-swell.	excess fines.	excess fines.	rain coo clayey.
en, Bellessessesses	foor low strength.	Important -	m, m ta e escesa finea.	thin layer.
Bendlu	Ton out and pure			
Special Control of the Control of th		)		_
Readle	roor ,ow atrength.	Improbable:	Improbable:	thin layer.
Jersu, il-	errink swess, or strongth,	'Improbable: 'excess fines.	Improbable: excess fines.	form excess sodium.
4-70			1	1
Petta-	ionr low atrength,	laprobab r	Improbable: excess fines.	Poor:
*#/h=+	low strength.	inprobable	eross fines.	slope.
Р. 11-	Pair: low strength.	Improbable:	Improbable:	Good.
p, D				
No. reastons y				
F, , 2m (	Pair low atrength, wetness,	excess fines.	decres fines.	3a.44*
Hom, Parely Slooded-	Patr low strength.	importante opoesa finos.	excess fines.	p Dit s
Ph	P or brength, shrink-weil.	exprotest.e	paress fires.	A . 42 W.
	ditt. Titk-nastr.	1		
Cartor	interpretation of the state of	ercess fires.	excess fitter.	ritt .eyer.
¢p.●	4	ma dobah m	7. F B F	# F
Cartor	's ring-one 'I ow etrength.	excess fines.	excess fires.	thin layer.
Promine	- Poor	· 中国中国中国中国中国中国中国中国中国中国中国中国中国中国中国中国中国中国中国	T 16 -	r
1 1000	in atrength.	ex end fres.	el sin Cres	1.45° y -
Ceff;				
Cavo	Poor. low strength.	Improtable earness Piness	es and fires	F **
Jernald	-t Page	teperbatur	Improbable	м
A44#41@	ahrink-swell, 'low strongth,	ex eas tipes.	excess fires	ex end to furth

TABLE 13 .- CONSTRUCTION MATERIALS -- Continued

Soil name and emp symbol	Roadf Ull	Sand	Gravel	Topec11
			- ,	
ens hartier	Poor peolalm, low strength, spring-ment.	improbable excess fines.	improbable excess fines.	Poor srealsin, too claysy.
Sansardeneessana		Improbable encess fines	Improbable errors fines.	Poor: too clayey, area rectain.
og ge	Poor: low strength.	Introbable erress Times.	Improbable elected fines.	Foor: excess sodium.
Eakin	- Poor:	Improbable excess fines.	Improbable:	Pair: thin imper.
Jeraci i	- Poor:   mhrink-swell,   low strength.	Improbable: excess fines.	Impromable: excess fines.	Ponr. excess sodium.
Property December 1	Go d	Probable-	Probable	Poor spall stores, ares re leib.
и гла	h or low strength, ) shrink-swall.	"escount c escess fines.	improbable: excess fines.	Fair thin layer.
Licratein	1 w strength, shring-aweit,	Improbable escent fines.	improbable; excess fines.	Poor extent shit, writent, except modium.
	weiness,		1	ONCOME HOUSE
Englossessessesses	Poor   low strength.	'Improbabie	improbable: excess fines.	Pair toin layer.
pedrey	(Poor .ow otrength.	laprobable: excess fines.	improbable: excess fines.	Pone excess solium
F <sub>S</sub> 4.1	Poir arrink-dwell, lestmone, low etrength.	Emprobable: excess fines.	Improbable;	Foor excess solt, we there.
Eged Variant	Poor: shrink-awall, welless, low dirength.	Improbable extess fines.	dxcces (1.es,	Por escon shit, wellens,
Paramorth	and trength,	Improbation ( oxiona fines	'mprobable:	Poor excess sodium.
TeR- Cettys	low strength, shrink-awell.	extens fires.	Improbable: excess fines.	Poor alipe,
Qettys	tow strength,	improbable or them.	excess fines.	profe.
P-4	Poor low strength.	Improbable ) or eas fines.	Improbable errors Tines.	Pair small stores.
Graupan Graupa	Poor: low etrength.	improbable escess fines.	improbable.	Pair   amal. atores.

TABLE 13 -- NSTR TIN MATERIALS-C ctimaed

Soil made and map symbol	Roadft	Sand	Gravel	Topsoil
Java-	PA P	Improteste careas fines	Importante:	Fair: amail atomes.
eg¤t Her" Nighmore————	Porr strength.	.zprobab.c	Improbable: excess fines.	Good.
Jave	Poor strongth.	improbable ex ess fines.	haprobable: ercess fines.	Pair: small stones.
Mighgora-	Poor	Improbable	Ipprofeste	lood.
H, Euroad	low strength.	excess fines.	excess fines.	
Mobeldge	Foor low etrength.	(mpenbah e mscoud fines.	excess flows.	Los.
Ho9	energy by a remarkable and a remarkable and remarka	Tape habie ex exp fines,	Improbable:	Poor: excess modium.
Hur-by	Poor String-swe ., A M Eurosaho, area recuding	Importation en excess fines	Inproteb é excess fines.	Poor: excess sodium.
5 lekspota.	100	h .		1
した物理				
1949	Low strength.	Topo cable to come fines.	improbable: access fines.	STAL STAME, a ope
Potta	್ಯಾಂಕ ಕರ್ನಿಕ್ಷ್ಮಾನಿಕು.	'tp-ba' e el'ess c'hés.	Improbable: , excess fines.	fair amail stines, s ope,
JgC*				ka. =
-R7E-	Poor strength.	er ess fines.	ercess Tines.	poper a stodes
G. enhan-	Poor um atrength.	er ess fines.	Improbable excess fines,	Pair , small atomes
Kozis	fore   shelderswell,	oriess fines.	excess fines.	to there.
	Retness.			
La	Poor a maternath, shring-ame.	Toprobable et ess fires.	improbable eicess fines.	Prom
pf#	1	1	2	P F
TEL Services and the services	Poort  or ethenath, abring are	To, schanze es est (ines.	improbable.	· ,n ayer.
Parasoria		Tarn har a Les eas Stumbs	Improbable:	erens a fire
Lot, toB	. AA PANT ,ow strength.	ist tor e	improbable: excess fines.	pa di

tee footnote at end of table.

TABLE 13. - CONSTRUCTION MATERIALS -- Continued

Wap mymbol	Acadfil.	Sand	Orayo,	Engant.
LvA, LvB Lowry Variant	Good	improbable:	Improbable:	Good.
RaP, Mar- Mcrische	Proc shrink-swell, low strength.	extens fines.	excess fines	the layer
MA, MbB, MbC Miliboro	er Poor strink-dwe'r, low etrength,	Improbable eleaness fines.	*morroup* e * excess finos.	Form
oA- Nobridge	Poor: low strangth.	Improbable: excess fines.	improbable excess fire.	φουd.
lpt. Kobsidga	Phor strength.	Impr ban e	.mpr.bab.e	1 <sub>40</sub> nd
Flankinten	low strength, shrink swell, we theas.	Improbable:	Improbable:	Poor: thin layer, setters.
Oake	Good	Probable	Probable	FOR P A PERSON A
MB# OBbe	Good	Probable	Probable	ant, dienes,
Delmont	Good	Probable	Probable	
wa Lon	Poor area meriain, i w aireagth, slope,	improbable: elcoss fines,	Improbable: excess fines.	ares reclain, too elayey, alops,
ко	low strength, shrink-swell.	Improbable:	Improbable:	Poor: thin layer
明教。 MacColeman and Applica Pplica	or strink-axel, low strongth, area reclaim.	escesa fines.	Tepribable	Po r tus reayey.
igida Z	for area remain, low atrength, abring need;	improbable on eas fires	improtative chies	Pice time clayey,
r. Orthesta				
A, Attender	- Jaad	Probable-	Probabie	Poor stones, area reclaim.
gg= Orton====	90 00	Probable	Probable	Poor.

TABLE 13.--C Wolff "I N MATER ALS--upstinged

Total table and map synt .	Frad*ti.	34.nd	Gravel	Topmota
				-
gre noberene	Ha t a	D	D	
· Indiana	3. 2 pe	Probable	Probable	a npe, sea pt)nea, orea recialm.
				drea recinati
Panekter e	strongth, strongth, strong-in-	er can "inea.	Tapr tate el.ven fines.	Pos Atum ayer, welleas,
ra. Pra	- 2010		I manababa	De : e
Promise	Space - and	rr ess fires.	elcess fines.	two crayey.
et, Resalus sesses Ree	ow atmension.	mpr bat c caccas fines.	er car fines.	wair stones.
Rock outerop.		1		
Banesro-	Podet 9) ofe . 2) of E . See .	.stricat e	.nge hatse earean firen.	Por store. to the sin.
San Refe	1	1		
ARBERGHAMA	low strength,	TER TOT E	Reprobable, excess fines.	Porr
nga!			1	
T p n :	a cinseman	es ess fires	Improbable:	s ape. tax clayey.
		1		
ave Sargara	_ ! NAO B	1 -perman e	Improbable:	Parr
2102 2103	a tempera	wa was thres.	excess fines.	too o ayer.
^ps	s r' & ave , w ofre at , area rec 1 T,	ferens ines.	excess fines.	Pour alupe. tuo alayey.
· =	10-1-	Parababa 1	h	
eranter	supe.	FFOGED;	Probable	non   slones, arch recaim.
) * · ÿ	a pe	Improbable: excess fines.	mirital e mireas fines.	Pr r madpe.
· , y	- Pate 1 w sinemath.	Improbable,	Injer atle	JU03,
wata	- Date low strength.	Improbable,	eress times.	lood.
- M.B.				
off: Sully <del></del>	Pair: alope, low strength.	Emprobable excess fires.	Trynchat a es e a Tyrea	Foor slope.

TABLE 11, -- CONSTRUCTION MATERIALS -- Continued

Soil name and map symbol	Rondfill	Sand	3rave.	Tay#0.1
\$ <sub>0</sub> F6				
Loury-	- Fair .ow strength.	importat e excess fines.	internation fines.	Patr H. Dr.
Sayo				
Suy-	- Pair .ow strength.	es ess fines.	Topo table ettess fines.	Pair
3chamber	- Fate frope	Probab <sub>1</sub> e	Proteble	rar ama atsea mrearetain
an, Jah, Water	low strength	Tapachabie es ess fines.	aprobatic cticas fines.	ac od.
Vendte	shring-ser.	Eprotable of ros fines	"mprobable elorga "ineg	Poe-
Wendte	Poor shrink swell. 100 strongth.	Trimbat e	inprotet e escess fines,	to crately
le, Wp- Wortsing	- Poor LOW Strength, Shrink swell, Serress.	Improbat e excess fices,	encers ("ces	franc detress

<sup>\*</sup> See description of the map unit for composition and behavior chara teristics of the map unit.

## TABLE 19. -- MATER MANAGEMENT

er + fr +f 1 2 Po Some terms that describe respect have so the a are of the following the control of the control o . 202 . ye pier , r . a.te investigation. 77 , 2 Sol, name and . . -- - 21 rear \* \*p 2 80 100 man symbo grens. m no essily, Deep to seter 4 14 6 allow.y. Artestor Swep to water Deb. Holiston Widelighe man a series y Ses lat 4 .4 40.0 ten ho , 4 ----Seal, encourage A dynam , c.c. 1 ... j AT THE 9 41. re re wil, Peros dlowsy, agree. tary Jerau. 1----- Tright ---erodes essil, 9.7.1 et of a following a ALLEY S. AT. Blops, -- 5lope. a tam trans well to saint all ere Pettalences produc casily. erodes ensily. A DESCRIPTION grinner over the resident mi Bi Salas S erodes essily. 20,000 Payorabid----- Payorable. Francis recommend F 91 P 41 . If forgie \* \* W. derey diffe Hon Pr. o casinta y Favorable Flooding, Market & Same Wethern. f orleanseemen W lergte frost action. flooding. 1 1 70 see, age Pavorable----- Pavorable----- Pavorable, han, rare y Deep to water Biere Manager of the f, icielanness y 4 perpage, Erodes easily, Erodes easily, Droughty. Doop to water perce slowly. droughty. slow intake, tari to , a r Bu mmeek peros elouly. percs slowly. Charles Committee Percs slowly, Perce Slowly, Deep to water \_ tght-en en en y arodes easily. erodes easily. hard tops c Cartan Peros slowl. -/ 5 = /, er jes nab. y Here par Deep to mater arter---- 3.1grt-produm chally, n sen exat yy er op rib y | Slow Intake, Deep to water to as to perus sioni with the same droughty.  $T \leftarrow B$ Perce clouly--- a red to lum. Deep to water Droughty. etere es cas a 11 m Talight---droughty, "A V O-peres slowly. peros slowly. Peres clowly, Peres clowly, a rop addium. Deep to water a filtghteen Jerauld-----eniden castiga droughty. rac t part, erodes essily. et ess sout in Shope, Slope, Droughty. Doep to unter erodes essily, Chantierdepth to rock, elow intake. ary to pa F. 10, droughty. erodes casily. perce slowly. Slope, Slope, trous to Slow Intake, Daep to water Sannard----sent to pack 363 - 1 grodes esally. percs clouly.

perce slowly.

o. pe

TABLE 14. -- CA TER MANAGEMENT -- continue i

n1)	# P-M4	\$ "18 " "	Frat stop Affer tingen				
nap symbol	rhoery in	dixes, and	Jeainage	Irrigation	Terrares and diversions	Granned waterways	
r selection	9.1gh*	- Avere hard to park, excess solice	Deep to water	Percs slowly, excess sodium,		Escesa sodium erodes essil peros alculy	
Fuk no was a	Vilerate Asspage.	Nidemane Nam2 So packs	Deep to mater	Pavorable	Erodes susily	Eroden menily	
Jeras i	. ight	- Tevere Fart Dr park, excess soft Da.	beep to water	ferch alouly, excess sodium.	Perca alowly, erodes easily.	Fr eas solium in 46 ty, prodes such.	
Pam Pi	erere ter age. a.ope.	Severe recyage.	Deep to water	Droughty,	Slope, too sendy.	froighty.	
nerg	Moderate seconage.	Severe name to pack.	Deep to water	Force slowly	Perca slowly-	Perca Biomiy.	
f <sub>u</sub>	ritght	Tar 'o pack, me''eas, ekchaa Bodiwa.	p ring, per a elemin, excess selt.	Wetness, ercess sodium, porce scowly.	perce slowly,		
2.14 r.4K3 ti====================================	Moderate prepage.	Haterate hard to pack.	Deep to water	Pavoraple	rrodes esalig	irodes essing.	
le recyanismos	.ight	- Jevere and to pack, excess a flux	Deep to water	For a s. M.y, or eas a 11 um.	Erodos easlay	Excess modium, en sem can op perce of may,	
tg as	S ignt	- 'evere tan't park, extense, extense sait.	Percs sinesy, frust a sion.	imenmenn, et esn muit,	percula, percula, may,	'Excess nait, we' cas, percs slowly.	
hgus Variant	1" tght	Severe har' to pack. proffing, excess malt.	Perns s wly, frost action.	Prefing: etuess stitu	Posta sioniy.	Friens sait, welless, perce slowly.	
Farmeworth.	1	- Tevern for to mex, excess sait.	Seep to water	Fer s sinkly, ci est of 1 m, er det easily.	Perro aloway, erwies eustay.	Excess codium, cruics casi.y percs slowly.	
Jettys	svere	hard to pace	Teep to water	'S. pe	210 hg	Slope.	
)≻ Berrander - a - e retraga	Talgetara	3.18********	eep to mater	Pay rab.e	Erodes essing	Erudes cast.y.	
ent	a pay	".:g"t	.vep to mater	w. 15 <del>0</del>	Eroces eastly	'trodes castig.	
Jgv9+	N Tarace s epoge, alope,	9;1ght	Teep to water	ca ess sait.	Frodes easi.;	Erodem emai.y.	
ige*, HgC*: Highmores	Moderate: 'emepage; slope:	Roderate: thin layer, plping.	éep to «miter	2,390	arodem eastly	brodes easily.	
J6/8	Moderate sequate, alope,	S. 1ght	Teep to water	et esa part.	rotes east.y	Erodes essizy.	

TABLE 14. -- BATTE MANALEMENT -- Corticaed

Pall	Testat.		+	Pealures	250 Law	
Soil hame and map symbol	Post reservoir	Taha ements. Musea, and	) /malayes	Irrigation	Terms ea	Grassmi
EAST ASSOCIA	dream.		' trainage	The TREETON	livers'uns	AUCALMORE AUCALMORE
	1	1	İ		V2444	
I- 14						
Highmore-	Moderate	Woderate	Deep to water	i.ope	Ferdan and the	Erodes cant.y.
1126, 200 1 0	1 10	P 3 + 76 +	!	1. upc	CHINGES CRAIT?	CIUNCO COMEST.
	secoage.	F 4 7 40 7				
Kobridge	tu	Madanaha		7	P4	France seeding
NOLLINGS	feepage,	Moderate piping.	Deep to water	F costne	Prodes essina	perodes essity.
	secha@a4	half off		1		
HoB	-  Moderate:	Sekere	Deep to water	Peres Siow.y,	Depth to rock,	Escens andlum,
Hurley	depth to rock.	hami to park,			erodes exally.	erodes essil;
		excess solium.		lepth to ro k.		
Zn A B t						
Burley	- Moderate:	Severe	Deep to water	Perce simmiy.	Depth to rock,	Excess podium,
	depth to reck.			excess solium,	erodes exally.	
		excess acitum.		tegut to rock.		
Slickspois.	i e					
Disage Stores	1	:	1	1		
D. P. P.		1				
16VB		". 1gh"	feep to water	d be a	Зіоре,	1 - 2 - 4 ,
	arober		1	estess sett.	erodes easily,	Blonce cmalij
Betta	- Revere	Suight-	Twen to water	2, cpe	Slope.	. He.
D. 174	s,ope,		1	agage.	erodes eneily.	erodes east.)
	. , ,					
ige*	1					
1848	-'Moderate	". 1ght	Therp to water	3 200	Erodes easily	Erites castiy.
	aerpage, a.coe.			erress sever		
	1	4	(			
Glenham	Mademate	naight	Deep to water	5. ope	trodes essery	sendes eastly.
	Banpe.		1			
Y^	- 511kht	Takada	Per a a bear.	S. w intake.	Por 1116,	erfress,
Kr.la	0.7 ER 11	hart to pack.	po al ng.	publishe.	Pr 13 chair.	er des casia)
	1	ponding.	1		peris alou.y.	
	4 = 4 - 1 - 1	M . M b				
Lane	- 5.ight	hart to pack.	mep to water	Perce a.om.y	perca di many.	peris El W /
Cantre	1	na-1 to pack.			perca ar may.	peres at w 7.
ME#						
[ane	- 5,1gh1		Deep to water	Peros slowly-		Tyles captag.
		hard to pack.	4		becca around	bears arounds
Farmamorth	- 1.1ght	254575	Teep to water	.Feros alowly.	Perce Blowly.	x - 55 8911 At.
	1 ****	name to pa k.	,		erodes cently.	
		er ess sait.		erodes essity.		perce alowly.
	100000				(c	Large courts
Lowry	- Roderste:	piring.	Then to After	, kendumpie	Prodes erally	brodes essily.
manata.	and helps.	h.3 = .76 =				
Lot	- Roderate.	Severe	weep to water	5. Tpe	triving captry	Erodes easily.
Lovey	secpage,	Production of				
	alope.		,	1		
LT)	Severe	Cerete	Twes to water	Fevoran	Payorah comme	Fayorable.
Lowry Variant	neepage.	seepage,				
		p1p156+				
				***************************************	[h	Washington Co.
Lyg-erosson		Sezete Tourstand	mub to metab	Slope	Pay 1745, 6	revorable.
Lowey Variant	seapage.	piping				
		y - 3 - 4y			1	
GaB, MaG		Tevere	Tees to water	Tu peru	Zeros slowly	er a s. w.j
McClure	mlope.	hard to pack.		porca acousy.		
fin à	S, tyrkt	Car and	Deep to water	America o 14 g.	Bassa slow.v	Art two wants of
Millboro	1.15	hard to park	Sech no assume		erodes essily.	
		Hard on heave				,

TABLE 14 .-- WATER MANAGEMENT -- Continued

ria a h	Limitations S			Pesturen	affecting	
Soil name and	Pond	Romanagerta,			Terra ra	
sab symbol	reservoir	Clara, and	Drainage	Irrigation	and diversions	Oreseed Waterways
MbB, Mhc Mbasboro	Moderate s.ope.	Tevere hard to pack	Down to mater	Slope, perce slowly, prodes wastly	Peros slowly, erodes easily	Ecodes enally peros slowly
Mot	Moderate seepage,	Moderate piping	Deep to water	Plooding	- Erodes essily	Erodes easily
Mps				1	1	
Nobridge	Moderate seepage.	Moderate piping.	Deep to water	Flooding-	Eroden easily	Erodes wastly
Plankinton	Slight	Severe ponding.	Fonding. perce slowly.	Ponding, perce elowly.	Ponding,	Weiness, 1 percs mlowly.
Take	Severe	Severe secpage.	Deep to water		Too sandy	
0.100						
cane	Severe accpage.	Severe seepage.	Deep to water	S.ape	Too sandy	Favorable.
Deamngt	overe compage.	Severe	Deep to water	.broughty,	Too sandy	Droughty.
O+ F	Severe	Severe	Itsuan by	tor		
Osston		hard to pack	Deep to water	Slow intake, perce alonly, depth to rock.	Slape, depth to rock, arodes easily.	Large Stones, Slope, Grodes ensily
)KH	Moderato	1Moderate	Deep to water	hamen a cast a		_
Üko	s.ope.	hard to pack.	1	do se, erodes easily.	Erodes eneily, perce slowly.	, perma slowly
Cher	Moderate leith to rock; slope,	Severe hard to park.	Deep to water	Slow intake, perce slowly, alope.	Depth to rock, erodes easily.	rendes sestif.
	singe.	Sewere bard to pack.	Deep to water	Slow intake, perce slowly, slope,	is ope, i teath to rock, wroden easily.	Si pe. Projes ensily
ps1		Severe hard to pack,	Deep to mater	Droughty, slow intake, ; perce mlowly.	Depth to ruck, erodes masily, percs slowly,	Erodes castly, droughty, depth to rock
Orthests			1	,		
Critor	Severe annpage.	Tevere ammpage,	Deep to mater	Droughty-	Тос видау	Droughty,
brion	Sovere stepage.	Severe seepage,	Deep to water	Droughty,	Too sandy	Droughty.
Aps.						
,rton	levere set tge, suppe	Severe seepage.	Deep to water	Droughty,	S ope, too smody.	'.ope, droughty.
Schamber	zesbega z ./.e.	Severe Accpage.	Deep to water	Droughty,	too sariy	Slope, droughty.
	Ilight	Severe ponding.	Ponding, perce alowly.	Ponding, peros slowly.	Ponding, peros slowly.	Wotness, percs slowly.
Fromise	ilight	Severe hard to pack,	Deep to water	Slow inteke, percs slowly, droughty,		Erodes easily.

TABLE 10.-WATER MANAGEMENT--Continued

		introduce of the		Pratures	Stite time	*
The symbol	repen in	fall keen a,	Ira'rage	irrigation	ari diversions	Transcil waterways
Primite	the terate	Severe art se pera.	Deep to water	innu tetake, percs a wiy, in-ugity.	Perca e.ou.y.	Freder enely,
No m	CHILIDATE TO STATE	Maderate pipes.	men to ester	Pawarat	Payorab.e	Payorable.
in to	or bittle	N terate	ees to mater	5 120	Payorab .c	Pavorabie.
to off office.						
Sammer and the second	ent to r s	hard to pack.	eep to water	t y 'y.	Stope, te, re to rick, percala, may	droughty, erodes sautly
tare, gre nomer =	Tayare 19 17 10 ford	Severe hard to pack.	Deep to water	Slow intake,	Slope, in to rack, pares slowly.	Slope, 17 - 7117, erodes easily
·\$11	a spe .	Severe hard to park.	Deep to water	Slow intake, perce clowing, slope,	Slope, depth to rook, erides castly	Slope, erodes essily
Thamter	overe r re. ser, egr.	Severe seepage.	Deep to water	Droughty.	100 mandy.	in og ty
. y	2-50-0	Severe piping.	Deep to water	Slope, erodes easily.	Erodes easily,	Blogs, enally
, 4 , y	M neate	Severe piping.	Deep to water	Stope, erodes easily.	Brodes easily	Frodes easily.
Lowey	Made replies	Severe piping.	Emmp be water	31 ope	Erodes equily	Mendes mastly,
5 W		1				
~ y	3	1 16	Deep to water	or des explay.	eroies eseing,	de de aggrià
brety		nay were	Duep to water	\$lope		Slope, erodes easily
957			1		1	1
	**************************************	major the state of	Deep to vater	Slope, erodes easily.	Mrodes easily,	Slope, grodes ensily
haster	TO THE STATE OF TH	===+ 0.K=+.	Deep to water	Droughty,	Slope, too sandy,	Slope, droughty.
'A #	· Village of the	end to be	Deep to water	Payorable	Erodes essily	Erodes enetly.
4°, 92	* ************************************	evere F. CK	Deep to earer	51 ope	firodes essily	Brodes easily.
Minute of the	, CAPTER STATE	lavere lars topack.	Deep to ester	Slow intake, peros slowly.	Perce slowly-	Perce slowly.

## TABLE 14 .-- WATER RANAGEMENT -- Continued

		Limitations for		Fratures affecting -			
Soil name and Fond map symbol reservoir areas	Unterkness, disea, and revees	Drainage	irrigation	diversing	Transe.		
Vendte	511ght	Severe hard to pack.	Deep to water	Plooding, pures slowly, slow intake,	Per # #20W2/***	Perce migwly	
o, Vp	Slight	Severe and to pack, positing.		Ponding,	Panding, per b a. w.y.	Wethers, perca alway	

<sup>4</sup> See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15 .- ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated,

Soil name and map symbol	ept. EDA testure		finari v	Person			Umapet-		Liquid	P as-
		f elfies	AA 47	2 3	. 4	19	40	20	limit	1 1t
	16	-	•	2 4	-		-		Pet	1 1 2 2
·	0-5 " "y ay az	<.	A-0, A-7		1 200	100	190-100	70 08	1 12 00	
Artesian	for ay, arefy cay	- , =1,	4 7		100	100	95-100	85-95	35-50	2-25
	17-5. 0, 5' ) a, at ty (15) out.	, WH	4-7	0	100	105	90-100		50-85	-7
3e5, Be)						_				
Bead.e	6. 2 sy an ay		A-1, A	0-5	95-100	95-100	85-100	65-95	30-50	y
	23-5 .ay an, clay	, h,	A-5, A 1	0-5	90-100	85-100	75-95	55-85	35-55	1 -25
		Mily Ma			1				;	
Beadle										
begar a	not hay an hay		A-^ - A T	0-5	90-100	URG 100	I W.C. O.K.	F - 15	1	
	23-6 .ay an, - ay	K K	A-Na A	0-5	90-100	85-100	75-95	55-95	40-60 35-55	
		И , К			1				, , , ,	
Janes, december			And, web		1			-1	4	
	1 7-9 1 *y * 1, ay, ay,	B <sub>1</sub>	A- "		45.4	4	1	~ 1	4 "	6 - 14
	9-14 1 */ * A7, By,	H <sub>4</sub> n	A -			٠ -	4,44	h = 15	45.4	U - 4
	14-61 1 ty n sy nag.	. 14.	A-^	-	1		1	,	14 ml	
	clay loam,	RH, RL			,,			- 1	40	
≥ pe										
Better	0-3   Louis	,	a talkan	-5			,	- 45		
	25-c. Clay loss, loss		A-1 A	,r	, ;		7	4 5×.	1,	
Taka	0-8 Losa								1,100	-
		200	Anta A D.	W	44	4,-,	7 417	6 4.	3 *1	5-1-
	5-35 Loan, clay loan	. Y.	4-1, 4-7	ě	4 -	k .	* - 4 7	н ч	-4	
			A * ( A-*	-		-	4 p.	P =45	L <sub>b</sub> T	_ <,
h, Bo#	in-to Stratified milty	_ At _	A A A		1		4 - 4	4 = -	, r = 11 ° 1	5 .
	clay loss to	, 1	4-45 8-61		* 1		- 1	- 4	<sub>ac</sub> — i by	/- "
	fine sandy loam.									
3	-1 . Ay	7	A = "		h		4 =	94	tha.	٠,
Bullicheek	7 3 +y===================================		2-7				,		1	1 4 5
	1-6 By		A -	,			# m		7,	45-10
à = = ======	7-4 1 1 1 an-		A-ti							
Carter	mild symmetric as		g 7		4			4	Suite !	1 - C
	iden isy, a by loy	4. 92	1-~		1		1	,	4-45	
p.										
Carter	4-18 Clay, silty clay		14-5	0	A		4 .	22 -44	4,	4 414
	18-60 Clay, silty clay	4. %0	A = "	ŝ	4 -				- "	2 45
Frontse	, 1 ,.11 1 s/	. 4	1 2 7							
	"-4 Clay	W-	4-1	,			4 .			- 4
	42-60 Clay, silty clay	4 14 4	T - "	J			4	-7-20	n 4 3	- /
*,										
E40	0-8 Silt loam, loam 8-19 Clay loam, clay	A 100 Miles	4 A-5	ن			4		м	-
			-					- 10		

TAPLE 15. -- ENGINEERING INDEX PROPERTIES -- Continued

111 name and	her Fix	63 A feature	_ " seat f	inatio	n,	Pras-	1 50		20,50		. iquii	Panne
say system	-	CO W . Estate	Chiffied	! AAS	SHIPC	- 4			paint Street	-	simis	11
	- In		-	-		ir rea	-	10	40	510	Tet	\$P-16:
										1	21.0	
ngugagaaaa aaa Lg		Silt lotte		A-0,	4-6	0	95-100	100 95-100	90-100	60-100 55-95	25-40 45-70	5-15 20-40
	9-14	slity dlay, clay, clay loan,	Н, с	14-7		٥	95-100	95-200	90-100	55-95	45-70	20-41
	14-60	Silty clay, clay,	T, H, WL	1-7		0	95-100	95-100	85-100	55-90	40-85	5D-4
										1		
Chantler	1 7 8	Clay-		14-9		0	. 0	100	45 .	85-	65-85	3 5
		clay olay, very	HE, MAR	A-T		4	*	96		5 3	55-105	92-5 92-8
		THEY INT.		: " · "					00440	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	01-101	4000
	17-67	Weathered unicock										~~-
ARACC	7=4 4=, 5	Ay hy, very	н, Ян н, Ян	4 ±=7 A=7		o,	   NJ=100	45 -4		3-1 0		25-5
		ata y r 43,	i	1			}	1	1			
	15.00	destremed bedrock	H, MH	A-T		0	100	100	90-100	80-100	60-90	25-5
A.A.				1								
watel	0 -	Sizt loamester	in male,	And to	4-6	0	100	100	90-100	70-100	25-40	5-1
	*****	Histy of my, minty	t. ck	$\frac{f}{2}g_i = f$	1	0	100	100	90-100	80-100	40-65	15-1
	23 48	'y ' my, misty	w. CH	6-7	1	0	100	95-100	90-100	60-100	40-65	15-3
	45-6	by a Am, comm, camy annu	79. 101. M.	à-6,	A = "	0	100	95-100	90~100	<b>60-100</b>	30-65	12-
48 ) h	0 7	11.t .080	ML, %	A-8 -	A-6,	Q	3.10	100	95-100	90-100	30-45	5-2
	F=3n	Staty "cay amas,	no His	2-9,	A-7	٥	100	95-100	95-100	80-100	35-50	10-2
	16=60	By a HALL ADMR.	., "H	f.="		0	95-100	85-100	75-100	60-95	40-TO	16-1
Terra sydenamica.	175	11 * , nap	1, 7, 402 6, 4	1 A - 4 .	4-6	0	100	100 95-100	90-100 90-100	60-100 55-95	25-40 45-70	5-1 20-1
	9-, 1	' 'y 'y c Ay,	н, 1	A-7		0	95-100	95-100	90-100	55-95 [	45-70	20-4
		HJ NH		1 4-7					1	Ī	40-85	20-4
	19-63	'y 57, c.sy.	ที่ที. หนึ่	1 4-1			95-100		1	'		
זמרב ת	4 1	an, fire sardy an, sundy	1 4 1	14.4		0	90-100				20-10	5-3
	6-11	erry grantif survers cary torne s cary torne scary	77, a - 79,	A-1,	A-2	0-5	60-100	40-80	15-50	3-30	<25	107-5
· r tvá	1.1.	t	-W , ,	A = 4 , A = 4 ,		0	100	100		90-100		5-1 5-1
	24-03	fire saying and sirty and sirty and and and and and and and and and and	н, Ян, , Мі	A-7		L,	100	100	90-100	PO-100	40-75	15-1
	0-	111- 1000	4	14-4,	6-6	0	100	100	65-100	60-90	20-35	3-1
a mestelm		for ty a my, comy,	JI,	14.7			95-100		85-190		50-85	20-5
	1	dilty clay, tay,		4-7		0			85-100		40-75	15-5
	17-00	clay loam.	p he	N-		4	73-100	//-100	107-100	00-33	-0-13	2,1-0

TABLE 15 .- ENGINEERING INDEX PROPERTIES -- Continued

-			241		P =	4		r ,854		1 44 1	0.5-
Set, name and hap symbol	umpth	LA SHITUTE	i miries		1- 15			1		15.15	. 1
	Ţn.			+	1 ep	-	10	4,		7 . +	10.70 %
					_		- 1				
Ealin	D=7	Stat long	и .	A 4, A-6.		120	1.16	95-10	414200	£ = 4 h	5 )
	7-36	Staty c ay loam.	É "NT.	4-6, A-7 1		40 1	45-10	$\rho^{d_1}=q$	ь.	J = 2	- 25
		tay luam, loam, clay.	nu, CH	A-a		95-1001	85-1-6	75=}C	63+ FF	41mls	16-62
Padray	0-10	11.1 (Same-		, A-4, A-6	r	100	.00	40-202		_ h = et	, "2
	10-20	state stay ataty	. 14	2-7		12	1.0	45 ma	H back	4 -65	4-45
	c0-49	cing loam.	., .	*A=7	ų	1 100	45-1 0	y D.n.	n =. 3	a ye h	
		Zam, clay loam	CE, CM,	1 A -6 , A=7	v	i sa i	j5=4 t	49-10	6	1 1	- 14
Eg Fagas	1 64	loam, elay.	14 Mar 1 1951	A = 7 X = 7	Ľ.	1	105	44		t	) /=1 
Fgas Variant	-,	ty ny as	H. MH	1-7	Q T			4 · · · · · · · · · · · · · · · · · · ·	4 -4	4 = 1	: '
	20=63	t ty as ar, ar, ar, ar, ar, ar, ar, ar, ar, ar,		A = 7	,	95 .	#5-1 u	N P W A	* 12.45	ч %	
Passer	1-9	'(,' , sp	e , 1-H	A-4, A-5	)	1 2 2 4	1	42		h = 4	<b>- 1</b>
Fermsworth	1 4 5p 126=6	'Ay, n' ty ' ny Ay, n' ty ' ny eilty play lom.	i, Me	A = 4 A = 7	;	1 .	1.013	4 -	4 d 4 = d <sup>4</sup>	- '	- h
der, Jefeerensen Jettys	139-60	clay lam, clay		A=7 8 7 01 A=7		95-1001		H 1	-1	4	
dh A	10-4	Long	[GL, 10.	A-6, A-7,	0	[95-100]	95-100	67 A	- 1 4-1	4	н., ,
11005mB		Clay loss, loss	Jer.	4-6. A-7	0-e	35-100			1 - 11		
O.anhah	2-4	J. Ighana	, N.	1 x = 6 , A=7 ,	1	r.	et a	-4 + 1	0 -6		Ď=, ⊔
		ay car, an ay nas, as		A 6 , A = "	6	+ -,	45 4	n =	4	-	1
Javanna	0-8	A 434	His Tr	4-4, 4.5.		45 = 2	7 * 4		- 41	h.	
		Tun, by . sa	, н	A-1, A-1	7-5	4 + -	es	+ - +	F 4.	1 44	**
Hgr#, HgC#; H*#NHOTE	0-6	Lit reasonness	wL, .	A-1, A-5,	ņ	130	e <sup>c</sup> =1	5-4	1 - 2		7 =
		they have Am	*	A-r A-r	ú	11	t =1		4 - 1	4 4	**_
	143-6	ay . na . can	Jan 18	A = 4	5	145=2	N.S.	- K	11 m dr 1	4 -	_() = U ,
2 E 4 E	1.8	J 35	- M - I	3-4 A A	-	-	j = L.	* 4	- "		-
	9.1	47 47 42 80, 49 42	1 . W.	A	-5	95-100	85-100	15-95	160-85 1	30-45	19-25

TABLE 15 .- ENGINEERING INDEX PROPERTIES -- Continued

Sot, name and	Lepth	50A testure		12.81.	1 211		Praz-	1 2		24 (m25 ,		unial i	P. 85-
map symbol			Jr !	lfied	AA	SHTO	in her	4	10	40	200	, mit	tioit
	i in		1		•		5 1	1		1		Pet	
Han A P													
Highmore-	0-6	Sist .ohk	Mt.	7	4-4,	A-0.	٥	100	95-100	45-100	30-172	30-45	5-20
	6-2-	51 ty c. ay . com.	7.	MI	A-6.	å = "	5	10,	94-100	10-100	05-100	35-50	10-25
		"' ty c ay .cm; wilt loam,	* L.	ML	4-6,	A-*	0	<b>⊿</b> @5	195-190	40-100	85-200	35-50	10 25
Mobridge	0-14	51 1 .OAS	RL,	ct	A 6,	Ans,		.0.	. 0	40-107	~v (	53-45	h-20
	14-26	it ty c ay loam,	~	ĸ.,	A-7	A-2	3	100	. u	35-4"	85-100	15-55	10-30
			I CH,	NH .	A-6.	4-7	5-4	45 - D1	05	48-170	85 16	46-66	
	!	clay loss, milt loss.	,	42	a-0,			, - 03	77-20-	474100	B7=, 70	30-00	25-35
н Р		1 042	e.,	7 July 2	A-4,	June 1		. 2	1 0	+4-10	3 -, .	2 3-4	5-15
Hursey	33-60	Ay, and y clay seatherns bedries			A 7		0	1 2	1.5		5	40 ,	7 -00
Ha A *					1								
	0.2	1.t loan	ton.	81L	4-4.	A-b			1.00		30-000		
		Glay, shaly clay weathered bedress			A-7	1	0	100	100	15-100	50-100	50-90	20-55
Slickspois.			1		1				4				
IPE .					E					1			
79 AB	4 4-8	1) 8/8	H <sub>ara</sub>	h.	Ant I	4-6.	v	45=110	y5-44	31-45	50-85	13-45	,
		loss, clay loss	CL.	HT.	A-6,		0-5		85-100 85-100		60-65 60-65	40=44 30=45	.0=20 41=25
Patta	6-3	neganana a a ana	٠.	75 -MI	A-A.	A-e	0-5	97-,70	ro	" -12c	60-75	c0=18	ř, s,
		Clay loam, loam	CL		A-6.		0-5			75-100		1-45	40 25
JgC*:			1		-						,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,	,
~A = B	0-8	1.040	IC.	PF I		4-6,	0	95-10	75-40	50-95	5,-55	50-65	5-20
		Lour, clay loss	CL.	HE.	A-6.	A-7	0-5		185-100 55-10	80-95 15 15	60-85 00 85	,0±65 30=45	10-75
G.entan	1 0-4	W 25	ci.	ME	a-6.	A-1.	3	45-,03	75-130	85-200	50-65	50-50 °	8.20
		Clay loam, loam	CL		A-6.	4-7	0-5		95-100	85-100	40-84	53-ha	20 - 25 22 - 46
Lo			1	-								F 1=+6	
Es		Silty clay			A-7		0	100	100	95-100	22-707		5u
La	0-8	Silty clay loam	CL,	MH.	A-6,	4-7	0	100	100	95-100	75-100	35-55	41-25
±8ne	8-19	Silty olay, clay,	ICL.	CH.	A-7		0	100	95-100	90-100	75-100	45-65	24435
		silty clay loam. Silty clay, eilty clay loam, clay.	CT.	102.	A-T,	A-6	0	100			6500		15-40
		0.0, 100, 0.0,	1										
Lang	Q-6	Alls logs	.07		1-4.	A-6,	¢.	. JO	150	95. 200	60. 100	30 45	8-70
	9-, 9	Silty clay, clay,	Ict.	CH.	8-7			1 100			75-100		15-35
		m" "y my uman	15	400		, ,							
		Lay Loam, c.ay.			4-7,	x-0	0 -	100	95-100	45-100	65-100	35-15	15-40
Раграмос п	2-5	"t .cab	MC.	Zedle,	A-A,	A-6	2	400	190	90-100	70-45	25 40	1.45
	3-2-	ay, of ty hay ay, of ty hay, hay lies.			A-7 A-7		0	100 95-100	100	95-100 85-100	85-95 1 80-95	50-70 ! 50-65	20-40

TABLE 15 .- ENGINEERING INJEX PROPERTIES -- Continued

1 কেলৰ প্ৰৱ	epin	A Set afe	Train F	T = 1 1	*	TVHEST -	· · · · ·	Augusti	an pase	Ing	. lquid	P. 88-
rap s, be			610,64	2.0	2.		1	. 10	. 40	200	1.010	in fea
	P		+				1	1		1	Pt	1
t A, where	1-7		w -M.,	4-4	,l = t;	J	100	4	75-200	80-100	.5-40	5-15
2000	, "-th	† 65		A h ,	A-5	٥	100		145-17	dú-s	25-43	>-+5
	16	it an .cam. very fine party	H H	· · · · ·	A - h	)	160	4"4	41=4 4	* C = 4 4 4	, <sup>Γ</sup> <sub>d</sub> = id ⊕	3-15
LvA, promote to the second		t, ran	1/			3	160	7		75-10u,		5-15
		tom, silt loss	ч —— .	12-4,	Lab	3		2.	42-1-2	15-603	4 4 - 4 A	5-15
	20-26	Very fine sandy loss, fine sandy loss.	4 34-	A1		, 3	1	3i	N-5 + 4	45=55	26-35	#8-10
	26-36	Stratified loany very fine sand to sami.	M, Wes	A	Λ−÷	J	, 10	ah au	d =45	1 45	10	RF = "
Mg , Mg		·	- 14	١, 4,	8.4	2		-	( L	4 . []	1.47	4 :4
He gen	4	+ '1 '1, 40'.		Army	fi = "	J	4	×		No. v A	15 m - 6	41 = 3.75
	, ,	14 5, 63	, 4	ha!		4	4 L	4	futur	50-107	U- 8V	20-50
PAR PAR NA	1	1 1 y ny ny	7 W	1-7		7		*	je-	4	4 ~ 17	544
	= 71	, 0, 49	-9 M	2		9		,			- H	1 14
F Avec	4	At Moreon	M-,	Awm	4-4	7	-	V-100	V 3	1-1-2	32-41	5-10
	. 4	- 's s, -as,	y W	Lada,	A-	v		1.60	4	MZ	3 1/2	1 -30
	20.0	olay leam, silt	-	Antiq	A-		,5	-	45.		34-44	15-15
у п									1			
N ritpour	* * *	1 , 3/1		£ - + 5 -	A 4		+ 4	u	4 = 2	-,0	\$ H v	5-10
	4 = 5	1 47 NT	4 4	5 *	A . "			1 c	dhana	4,5000	demand or	10-10
	t wh	clay loam, milt		1	A - 1	E,	٠٩ , ١	3 .	111	84-1	[/ _/ f	15-15
PlankInton	6-24	Sigt loan- cing, silts dlay, clay loam,	Y - 4	$\frac{1-\alpha_{p}}{\gamma}$	$J_{i}=0$	,	1000		J		27-41 4 = 1	5-15 6-35
	24-60	Clay, eilty clay, elity clay loam.	-	1 1	A+		4-1- X	-	ASI W. A.	r	4 =44	15-10
98	0-4	Loan	٧.	A = 4 4	A-b,		10-13	0	F 445	15 SU	34-95	5-20
	4-14	Loan, clay loan	* 4	7.5	A - 24 .		4	5	50-45	40075	57-45	5-24
	14-24	Loss, sandy loss	y .	A	$\begin{array}{c} \lambda_1  h_2 \\ 1 \end{array}$	0	90-95	10-95	10-95	12-75	20-115	5-20
	74-50	Very gravelly .nq, very gravelly loamy sand, gravelly and.	er 4	A t	λ.,		30=85	30-75	10-60	0~30	C25	NP-7

TANK FOR -- The Nobel No. 18 of the Form Council enterior

Soil mane and	Danks	USDA testure	Ganat.	Cicati	OR .	77ng-		P+ - + T	185 365	वर्षेत्र ।		
met slupoj	Depth	USDA ERECUPE	Unified	AA	SHTO	ments C 3		755		1	1,413	P.68-
	1 271			<del>-</del>		1	3 4	13	40	22		inser
Men											р.	
db# Onhe	1 0-6	Lous	Et. Ct.	14-6.	2.6	0		'_				
		T		1800	A-0,		4	7 ^	L = 3	50-50	34-45	1 5-23
		Loam, slay loam	CL, ML	A-17		0	die.	74-14	p may	- v-75	4 -45	5-20
	14-24	loam, sandy loam	CL. CL-NL	Jane .	Ault.	0	44.44	7 - y E	n _496	37- "4	c0-65	5-70
	24-6	sery grave up	H, Y,	1-11	A-L.	0	< -5	L	3-6	2.4	2	548 - 2
		gain very	Ja, Ge-	A- 1			1				,	
		PR '. Brase .y	)	h			1				!	
		mard.									,	
Delmont	U-3	2 50		A-F.		G	8 A.	3 - 5	h = e	+ 75	2 H = 4 C	6 73
	1	After sandy	. N	het.	4-5	O	H.C.	'	-	+ +7 <sub>\psi</sub>	25-44-6	2077
	115-6	reny gravely	Y 74-74	4.	1.3	0.5	1	и				
		54 , 75 y	31-, , , ,		4+2	0-5	journe	* -5.	.7-	1-4	£	43.00
		Siri, grave y										
		sart.										
eF	0-8	How term story	18, 19	A - "		25-50	. 3	15-1	-O	35 4.10	b Dr.	
Okaton		C ay, at ty nimy,										3
		a'n y . ay		A -		25-50	. %	44 = .	+3- )	4	5,005	20-40
	*0+03	Workt ered tedno k	-H., 197	A - "			. 01	$4.5 \pm 5$	rl-,	distant	40 , 0	6
· H		/ 25		A-0.	Au "	0-5	g 4 .			8. BF	1. =80	-,
ko	17-6-	Ay am, ray	, C.	A -7		0-5	2 01	*	T -		4 64	. "
t n-c						4-7	, -,	٠		65 95	pr 7 =	40
ope.	5-4"	S' ty c.ey.	H MH	A -		č		2 E	4 - 4	4	b 5	25-25
	4"-03	Westhered Sedrock	H me	T		F		43=1		8 0	00-51	4-60
п		· 45	*e #H	4		0	5.			rì	60-63	24 - 45
PEL	12 14	. 1)	M 4	A-"	-	5		à	3	3000	ps Ha	5 450
		4), 45% / 5 %,	n, %d	4-1		0	4	ر پ یا	4 -1	3.	65.05 13.45	50.50 25-52
		went sha girlay weathered hedmig								-	,,,,,	2 -0.72
	4	medic levels less. 4			_							
rthente	1											
	1											
Prison	6-14	P' - seniy Loaz,	H W	4-4,	4	0	95-100	85-100	75-90	55-75	0.40	$a = y^{2a}$
		. 15.	v	1			132-100	02-100	10-32	35-75	c = 35	DE WAL
	14-37	when sandy ham, "	V, V,	11-4		0	95-100	185-05	16a.pn	lac ve		11. 10
		N1, Saf 1;	9' .				177-200	103-33	100-30	135-15	. 7 - 5	5/-10
	37-50	" an " and " and",	10, 70,	A-4.	i-,	0-5	30-60	125-60	115.40	1.0-30	2.5	N1 =5
	1	very grayey	or, or	4			130 00	1-3	10,000	1 -30	E.	Mr = >
£.	f .	5 63		t								
TLOT	2-6	· April	W r	Awil .	A-6	0	95-100	85-100	75-90	55-75	1-4-	F A
	, -,,	dire sandy scan,	34.	A		0	95-100	[85-100	70-95	35-75	35	Jtl. 19
	14.77	F' * 84' 1y 2F.	- W			_	Inc. see	^-				
	11	1 33, Serby		* 4		0	J95-100	182-99	60-90	135-75	2 2= 5h	1(1)
	1***1	ans y sant.	- AND		+	A =	174 60	136 75	lad as	Laure		
	, -,,,	YET FRAVE IS	24, 24, 50, 31	1-4,	A.T.	0-5	30-60	(5)-60	112-40	0-30	25	MT+r
		6872.										

TABLE 15. -- ENGINEERING INDEX PROPERTIES -- Continued

Sott came and	Lepth	5 M festane	- Taba 15	41,		Production of the			ge pass.	ing	Liquid	F 15+
map symbol	repon	ar of the care	nucled	AA.	1110	3		. In	40	200	limis	t lea
	in.					D	1	+			PE	1 100
Schamber	F=0	Loan-	и ти,	1.4,	A = 12	0-5	95-100	180-95	165-95	40-10	25-40	3-15
	3-60	Oravelly sand, gravelly loany sand.	9 - 58 - 58 . 30 - 18 - 18			0-15	30-80	15-50	5-20	0-10	<25	NP-5
Plankinton	6-24	Silt loam	ma Merca Ma	A-4.	ДЬ	0	100	95-100	90-100 90-100	4	- 4 - 4 - 4	4 = 4 .
		Clay, eilty biay, ailty day loss.	#4 14	A-b	A-7	,	95-100	90-100	85-100	ty's = _	39-01	44-4
rA, Pr9 Promise	7 -47	Stity clay	169	A 7			100	100	190-100 190-100	d .	45 ± 7 4. ± b	, 6 · 6
		Clay, silty clay		JI = 7		0	100		90-100		* **	2 t N
es. Reb Ana	Q = 7	Loan	. 4	A-4.	Y-7'	L	95-100	190-100	:80-100	74-15	4 -45	p = -2
		clay loss, andy clay loss, silty clay loss.	-ţ.	Anh.	A-7	)	105	90-100	70-100	45-45	44.	25.7
	20-69	Crestified fine	Me of 3		A-*1.	9	4-100	H=-==	73-10.	15-55	25=41	* = 2 2
aya Rock outerop.	,							1				
Sanaarc <del></del>		Shaly clay, very		A-7		0	[80 <del>-</del> 100	75-100	75-100	75-100	60-90	25-55
	15-60	olay. Weathered bedrock	fon, wh	38-7		0	100	100	90-100	Bries	1, 44,	4 - 55
are, Sape				la d				for som				
Sanaarc	4-15	A / 1 , Yery	- MH - MH	A-7		0	50-100	75-100	90-100 [75-100	35-100	Q =40	25-7
		Weathared bear ox	Carl MH	]4-7		9	100	100	]90-100	89-100	60-90	25-55
пра1	-4 5-41	ay	8/4	A-7		0	100   100	1 4	1 44	80-100) 85-100[	t = 14 c	25-45
		Attended		4.4	6.0	0-5	1		05-15		25-40	55
Schamber		Grave y ently Scaretay 1 any	W, SW-SM,	1-1		0-15	30-60			0-10	425	107-5
4	9-4	Sist loan	King and a	4 4,	200	J	Luc		45 + 0	30 xx	6.40	+ 15
	460	Silt lone, very fine sandy loam.	ML, CL-KL,	ja-k,	4-6	9	100	100	190-100	85-100	20-40	3-15
oC*, SoE*: Surry	D =4	51.1 .066	Harrier	A - A	A-r	า	160	, 100	) -12	30-103°	$\hat{c}^{(1)}_2 = iq$	5-45
	4-60	Silt loss, very fine sandy loss,	ML, CL-ML,	A-b <sub>1</sub>	k-6	a	100	100	90-100	85-100	20-10	3-15

		1,989,	TAPE R	7013	Pe		number-		17-14	P.as-
ash name and	Repth FPA texture	f Triffied	AAFRTO	te hes	4	10	. 40	200	.imit	ti is insex
		+		3 9 1		1		1	F E	
min, Saye		1		1			1	,		
A 475	0-7 Silt .oaz	-11E, TL-N.,	A-4, A-6	0,	100	100			25-4-	5 45
	1 7-15 Firs Load	or T. Chath.	A-4, A-6	1 0	100	100	95-100	80-100	25-40	5-15
	1.5-60'sloamoamoam.	ME, us,	A+4, A-6	a '	100	100	95-100	70-100	25-10	3-49
.E.			1	i			(			
Sully	0-h   312t loam	- 10, 21,	A-4, 4-6	1 0	100	100	y5-1>	30-130	25-40	3-25
	4-6: 1.1 .oss, very fine sandy .cas	iles, <sup>™</sup> less.	, * A-A , A-5	1 0	100	100	90-100	35-100	20-40	3-45
Schamber	0-3  1048	- VE SV.	A-4, A-6	0-5	95-10	80-95	65-95	40-70	25-40	3-1
	3-60 Gravelly mand, gravelly lossy sand.	# # 76 31		f -=15	16-80	15-50	5-20	J-10	425	NF-5
ns, BuB, UnC	0-9   511t tomm	- F-: E	A-R, A-6	Ð 0	100	705	130	94-100 95-10	25-40	3 1 2
	23-60 Silt loam, very fine mandy loam		A-4 , A-5	0	103	1 .05	100	95-10	25-40	5-15
Wendte	5-60 Strettfied silt;	H, WH	4 A = 7	, D	103	132		79-33		29-45
Wendte	5-60 Silty clay clay loss to clay loss to	TH, WH	A-T	ô	100 100	1,0		) 0-103 PG 13		20-45
o, Wp	0-5 Silty clay loss		1,-7	J	100	100	35~100	185-100	40.60	15-3
Worthing	5-12 Silty clay, clay 30-07 Silty clay, uil clay loam, clay loam.	Ly . ".	A-7	ŏ	100	44 . 1	95=IC	85 , (	50-76 40-65	22-5 15-3

Files learningtion of the mag into for composition and behavior maracteristics if the map unit.

#### TABLE 16 .- PRYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol | seass years have than, means now than. Entries where "Fr also is they -- " apply to be entre privile entries where Tains above that its group and "case, at or apply to entries approximate of an entry indicates that data were not available or were not estimate."

Soil name and map symbol	Depth	Permeability	Avet able it.		presia.	fa 1			safter
	<u>In</u>	"F, "NE	1. 2° 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	4144 4 4	7		-	- 15 4 .	
Arteelas	5-17 5-17	0 2-4.6	16-7 2. 6 2-7 6 10.1 - 27 7 4-9 4	2 2=B	Minners and	3 3	-	11	1-4
Beh, Beller	6 1 6 1	6-2.0	7 (A 7 (2 A ( 7 A	e de	N ACALES	, H		9	44
Berke Fra 1, e	7 - A 7 - 3 7 3 - 10		h-+7 4 -7 3 2 - f-8 4 1 - 4 - 5 4	3	dia a	1 2H	1	6	$\tilde{r} = I_1$
Jerau, d	2-3 4-14 14-60	2,6-2,0 2 2	F R=9 + F=7 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	4 A	IN incate	1	1	ė.	1
Page Lettmennennen	75-1 4 78- 27 .	6 -7 5 1 -0 +6	7 A R R R R R R R R R R R R R R R R R R	,	W terstell	.28 37 37	5	46	1-3
Java	0 = N 25 = 5 T	0 6-2 0	18-1,3 * 6-1 8 11 1 1 1 1 1 1 1 1 1 7 4-9,4	t ĝ	W innyin W migin www. W englesiss	28 37 1.37		€b.	- 1
Hon ,	0 2A 28-6	( 5-6 x	11- 1 6-6-4, 4 11- 1 4-5, 4	1 1		24 32	ь,	5	$h_0 = r_0$
Rulldrook	17.6	1 0 06	1	4-5	Sary 11gh.	37 37 31 37	*>	4	-a = Ua
arter	9-4 4-4 ,8-6	,6-2,5	H	2 - 15 4 = 17	W INTATROVAN An 2 P AREY FARM	37 37 37	1	6	2-4
**************************************	10-6 10-63	n n 2 n	3-0 2-14 ,-7 8	* * * * * * * * * * * * * * * * * * *	Windsigna v v 'v vers (K'	3	1	6	. =4
Permit service	1-1 1-1 1-0	. 2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2+4	**** * ***  ****	47	4	ч	- 4
Cell Cell									
.2YO **********	0-5 N- 4 14 53	3.00-6 6	4- 2. (5.1.47.) 8 4-7. 4-7. 4 1. 4-7. 4-9. 7	1 1	y innate	1 1	1	to .	>
Jern gylnamage '	0-2 9-73 9-73	1.6-2.0	8	A Date	Modernia e	3	1	4.	· - 1
Than the	0 = j 1 d 8 7	1	(4.0 ) + 4 4 4 0 = 2 1 8 + 1	4 · 6	eny ten	47	¢		4

See fo stante at and of two e.

TAP F 16.--PHYSICA, 451 THERE AL PR PERTIES UP THE SCILS--Continued

Soil name and	Septh	Permeability	Avatuable		Salinity	Teatral and a		elon .ers	Hind	- Organic
			Chia 'y	remotion		polentia			121 47	y marte
	<u>In</u>	To pe	r_r	245	TOTO 3 CE	-	-E	<del>                                     </del>	SC- up	Pt
C=E=										
Saraero	0-9	0.96-0.2	6,09-5 4	6.6-8.N	2	Yers bish	0.34	1 _	1 .	
	45	0.06-0.2	C Sec 44	4 A B A	2	Very bigh	0.37	5	1.4	1-2
	15-0"			5.6-5.4		The Property	0.731			T
Do A®	1									
Tedsey	0-10	3,6-2,0	1 .4-0.55	2-1-1-1	2	LOW	0.22		1	1
	10 57	1 2	4-1 . 4	0 6 . 8 4	2-8	High	0.37	3	6	5-4
	48 60	0.0h ( 6	5 - 7.27	* 4 - 4	4.00	H1gh	0.37			1
	40. 00	200-0	C. 4-0	*.9-4 )	46	Moderate	0.37			3
Eak! n		0.6-2.0	0 17 9 22	6.,-". 1	12	Yorkrata	0.32		1 .	
	~ b	0 8 .0	2 Hall 2	4.8-3.4	4	w erasm	0.32	5	1 6	5-4
	36-60	0.2-0.6	2-2-5	* 6-9.3	4	Muderatesses	C. 43			1
Jerauld	0-2	5.6-2.0	0 .8-0 2 4	5 6 7 1		44				
	5 - 3	7.2	-0	4 4 4 4	2 5	d gravana		1	6	1-3
	Q = 4	7 2	1 (1)	3-9.3	46	12	- 12		,	
	×4-60	0.5	7-40-W 13	7 4-4.9	in b	h'6'2	2 34			
DeD	0-4	0.6-2.0	0.18-0.20	h 3 - 7 H						
Delmont	4-16	0.6-6.0	0.12-0.18	1-" H	5 1	* 'A	0.28	3	6	6-4
	16-60	6.0-20	0.03-0.06	4.8.4	2	~ K+	71.3			
0	C 17	0.6-2-9	7 76 7 7						1	
DOTTE	17-27	0 4-2 0	7 19-2 .2		2	X-10	0.35	5	5	g with
	27-60		0.11-0.17		2-4	Higo-				
·	0.1			* * * * *	1		0 12		1	
urratein	0-1	0.6-2.0	21. 5	2 7 3	4-20	JOHNSON		1	6	4-3
	19-60	0.2	-1 h -	2 2	4-,5	4124	0-37			
1		1	4	,	4-,-	d governmen	0.37			
Edg1n	0-7	1 1			1					1
1	7 36	0.6-2.0	3 21-3 22 1	fT 1		Mindersteiner	2.32 1	- 5	1 6 3	2-4
	35-65	0.2-0 6		a demand of		# # g*r	43			
D		- 7				m. derate	11.93			
Deurey	0 10	3 6-2.0	7-19-0-3	-7.3	+ 2	/ W	C 37 1	3	1 6 3	2-4
}	27-48	0.06.1.6		F = 7 - 8		-121	19			2-4
	48 60		Dannen and 1		3 P 4-16	2	- 17		1	
					4-10	4 - Jeraie	× 57			
Egas	3-1	G. 6 . 3	7. (	0 0	7	-12	28 1	5	1 7 1	3-4
200	1-00	0.06-0.2	0 35-3 ,317	9-9.0	19		7.48	-	1 1	
H	00	0.36-0.2	), . R. O. 3 R Y	4-9-6-1	4 .	-1				
Egus Variant	13 53	( 1-1 2 )	7 19-, 14 7	4-3 4	6-4	15'	37	5		4-8
	27=60	0.06-0.2	0.10.1" 1	.4-9.0	N-Ab	1187				
h	C-9	9.6-2.0	0. 8-7 2: 4	4 4 4						
Permanon h	1 4	2 2		19-1-2			4.37	3	1 6 1	2-1
	25-60		18-1-6	-4-9		112	0.37		1	
R. 749	^-2						4-71			
le*tys	2-33	0.2-0 6 ''	116111111	6-4 6			1 8 1	5	45 1	1-3
· ·	39-50	0.2-0.6	11-0 17 7	4-5.4			0.58		1	
. 1		-1. 11.	444-0 .		100	1127	9.75			
A anthon	2-4		F 2 ^	, , = " , 3	2 8	Interace.	3 .8 1	5	6 1	2-4
A SCHOOL ST	11-60	0.4-2 /	Em a P		2 9	C miginaman	90	_		2-4
	11-00	0.2-3.6	.6-7.2 7	, 4-4, 4	4 , 3		1,47			
P4									,	
- 411/4M	Sulf.	6-2,3	5-0 2 6	. 1-7 3	2 9	la rengr <del>ación</del>	. 8 1	5	6 1	20. 20
	4-11 11-60	0.0 -2.0	1.18-0.2216 1.16-0.20 7	6-7-4 -	6 9		1 45	-		5-4
					<4 8	boerate	0.37			

TABLE 16 .- PRYSICAL AND CREMICAL PROPERTIES OF THE SOILS-Continued

	E 16-17-100-1	101	E sub cutser	ORL PROPER	41113 G	THE SUILS-COT	it i ning			
"o" page and	ep++	On second 1 At	1 2 4		le. Intro	of mink-asse	En n		167 - 1	
riat symbol	Æb	Lease Work Try		rearti n		A LET LIA	- 1- 1	C.P		rganio
			1 14, 14				*	7	et ut	
	1.0		1	_ <del>_</del>	73 0 7					Pag
Teles		and the second			2				1 . 1	
20.2	н с	r 2	1 14 1	* 4 6 4	2	W. ferblesse	0.28 1	5	6	1+3
	Hand of	C 6	, at more	7.4-b 4	щ	Routeafers	0.17			
Special gradual		1	1			1			)	
~ F 37. > F =	-1	0 6 .,	1-	1	1		u se f	4	6	2-14
	7	- 1		7 7 4 7	4	M P A T MA . A	F 44 F			
	4 -	0 16	Aur.	7 4-4 5	$\varphi = 0$	Midneatessa	0.44			
20 ft = -	11-11	1 6 5- 6	18-	4 h 4 h	4	W locald we.	0. E	5		1-3
	- 13	P 1 5	1)	4 = 2 = 4	2	4	4.4	,	, i	1-7
	4	5	, F. m.	a H	8	M . A . A	F 1 4 M			
stm A.4										
1 % pillion to service and	7-1	1 1 1 1	17		5	A thefteres		>	6	2-4
	. = 0	~- "		4 7 4	2	* #4				
11 to - 1. to	= la	* m *	1 4							
N	1 - F					4	12	1		4-6
	F1	1.	1 100	4 8 4	2	W. ersterne	Fers			
ДР	1-	0 0 -7 0	.9.	h 7 (		W inpain	9 44 1	1	6	4-6
suriey.	-3.4			4 7	4 .0	1079 67	4.1		1	
	4 10	1.27		4	2	*E 9 'F				
Ma #							1			
Par Pfeesen	C.	1	1	4 6	4	Y lengton	4.1	4	ъ	3-2
	1 46.7		_	r H e	2	127 1 81				
Name of State										
*IIVII a a a a a a a a a a a a a a a a a	-27	)		Fu A	,	W designer and		4	n	1-5
	17.	111			2	Vinterate Am				. ,
	4	Taller 1	-	4 4 7 4	- 61	N white	1.			
fortry cases a		1		7 4 7 4		W 1 cate			46	1-3
	1,1	^ _ (	-7	4-5-4	- 14	A letare -				
1.00									1	
29 B	~H	6	**	1 + _7 H		Winegto .	-	9	, ,	1-4
	4			4.4		W never			4	
	24.45		7 4	2. 5.00 4	m	W Jefato	3"		,	
)_mr*nm	-4	h.a.		7 - 2 h		Y emateurs	- 19	5	6	2-4
	4 1		* .	4-7-4	4	A luka, comm	*			
v								5		
¥^	7-1	, i	=_ 4	1 4 7 4			7	4		2-4
	-									
N	4-1	4		$0 = \frac{1}{x} \cdot \frac{1}{x - x}$		W. terhieran	H	5	" ]	4-0
	, 2 at	F	-	7 4-5-4	-	£	47			
144										
At Passace connec	7 5	ŧ		( v7 1		W terate	אל ה	4	7	4-5
•	4 3		0.11-0.20	7. 8-8. 8	4	6	. 11		1	
Pitringworth	.H	h	0.10-0.22		6 - A	W letafe	4.7	3	6	2-4
	Prop F	C = 1	0.08-0.12		4- 6	7	A 7		1	

TABLE 16 .- PRYSICAL AND CHEMICAL PROPERTIES OF THE SOILS-Continued

Sot, mame and map symbol	Depth	Permeability	Avn' 45 e	5/ * res 51 m		y orriba		3 55 7 773	ministration the	ngant Nav di
	Ir	In he	1 12	28	207 0	E.			1 2 2	Pit
Lowry	0-7 7-15 15-00	0 4 2.0 0 6-2 0 0.6-2.0	0.15-0.20	P- 5-0 4	5 3	Name and	C. 7.	F <sub>1</sub>	5	2-4
Lva. ivE	0-11 11 00 20- 6 26-36	0 6-2.0 0 6-2.0 0 4-2.0 6.0-e0	0 17-0 22 22 7,15-0,17 0 06-0,10	10 年 B B B B B B B B B B B B B B B B B B	4 2 4	, 4	0 .0	5	5	,h = 44
MaB, Raf	04 ,4- 2 22-50	0 6-2 0	10,19-r 22 1 19 0,28-c,16	e + 8 4	2 7 4	R 10-3*0 * 2 h_23	1 02	5	1	2=4
MbA, MbB, Mb	0. 5 5-16 16 50	0 04-0.2 7 15-0 2	0.134	h = _ * =	24	HISH FIGH	0.17	٦	а	2 - N
MoA- Modrilge	0-14 26-50	0 6-2 0 0 6-2 0 0,6-2,0	0 19-0.72	F 5 - 7 F	2 2	K chair	0 % 0 % 0 41	5	6	4 -6
Np* Nobridge	0 - 2 N 14 - 26 26 - 60	0 4-2 0	2 13 4	A A 7 B	2	M lengte	1.	5	5	4-6
Plankinton	0-6 6-24 0-6	0.6-2.0	10.19-0 10. 5-0	A -6 -	2 8	H Jenshe	0 %	3	ð	i-t
On- tabe	0-4 4 · 5 14-24 24+5Q	0 4-2 0	0 18-0 21 0 18-0 0 18-0 0 23-0, t	5 5 - 5 - 5 - 6 5 - 4 - 5 - 4	2 2	# # #	7 -	4	6	4
od No On he	0-4 1	0 5-2 0 0, 5-2, 0 5 5-2 6, -20	0 14-0	* 4-8 E		¥		4	6	r-4
De Laont	0-4 6-6 6-60	0 6 0 0	0 19- 7	A 1-7.5	5	, Man aranar	0 27	3	å	∠ - 4
One ton	0-4 4-16 16-60	0.06-0.2	0.11-0.16 0.11-0.16		1	1 F ,	-,*	Z	d	2
OkB Oko	0-5 5-12 12-60	0.6-2.0	0.18-0.20 0.11-0.17 0.06-0.12	*. 8	4 4 3	M ora e	· -	,	ь	z 49
Opel	0-5 5-37 37-60	<0.06 <0.06 <0.06	0.10-0.14			res t ph		4	7	4
Opel Opel	0-4 4-12 12-19 19-24 24-60	<0.06 <0.06 <0.06 <0.06	0.10-0.14 0.08-0.14 0.08-0.12 0.08-0.12	2-4		(77) 85 (77) 17 (77) 17	- 1	6	44	4
Or. Orthenta					)	1				

TABLE 16 .- PHYSICAL AND CHEMICAL PROPERTIES OF THE BOILS-Continued

Soil name and map symbol	Depth	Permenbility	water	Soil resction		prink-see	Fa .		6 11-	tatter
	In	11 12 P	In in	pH.	व्यक्तक्ष्म त्र					3 <sup>5</sup> 5
orton	0-1 6-14 14-37 37-60	0.6-20 2.0-6.0 6.0-20	0.12-0.17 0.03-0.06	A 7.1 8	<5 25	Low	5,24 - 34 3,74	д	3 <sub>1</sub> , 1	2-4
Ower Orton	0-6 6-14 14-37 37-60	0.5-2.0 0.6-6.0 2.0-6.0 6.0-20	0.14-0.20 0.12-0.17 0.03-0.06	7.4-6.4	(2 (2 (3	Low	, 76 , 76 C.	ц	4	
Echamber	0-3 3-60	0.6-2.0	0.15-0.18	6,1=5,4	(2	LON-	0.28	5	1 4	.5-2
Pank'ntor	2445.	7.6-2. 2 0.04-0.6	9= 7 4 2 Hedan		3	1. Ry	0.32 0.32	5	0	En.Ps
Pris. Prise	7-42 42-60	(0.2 (0.2	0.10-0.12		2-4	very high	1,31	5	М	-4
H+A, ReP	20-60	3,6-1,0 0.6-2.0 0.6-2.0	10.09-0.20	F . A G	7 72	low-	0 A	2	P	2.4
Rays Rock outersp.										
Sensare	0 4 5-15 15-60	0.06-0.2	5.08-0-15		7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	1054 145	2.37	2	4	7-4
Sale, Sale.	0-4 4-15 15-60	0.36-0.2	0.08-0.1		4	Very high	0.37	٤	44	1 w 2
Capa .	0-9 5-37 37-60	co.o6 co.o6	0.88-0.1	7.4-8.4 6.6-8.4	á	Very high	0.37	ч	9	, -4
Schamber	0 3 5-60	0 1- 1	2,94 3,00	e e e e Gallet e	2	P034	2.28	4	1 0	p ' p
767	4-60	0.6=2.0	1,25-0 2	6 6-7 9	, 2	/14			ł, ,	1-4
BoC*, Soda:	0+4 4=6 :	7 F=7 C N_6=2.6		n,r=7,6	2	() N'====================================		h,	4	E = 4
Lowpy	3-7 7- 6	0.6=3 h 6,6-2-0	Garage	* * * * * * * * * * * * * * * * * * *	2 2	Manage 4:	0.4	<del>ن</del> ا	2	1
SeE"	7 · 4 4-60	0.6-2.0	0.15-0.2	0 7.4-8.4	į å	Lov			4.	
Schamber	0-3 3 00	¢.6 ≥ 0 >6.0		# 6, # 4 6 7.4-8.4		Ton-		2	to	1 5-2
Val. Units Units	9-23	0.4 = 0 0.4 = 0		4 * 1 = 7 = 8 7 = 8 = 4		A	0,45	*3	Ь	4,-4

TABLE 15 .- PHYSICAL AND CHEMICAL PROPERTIES OF THE SOLLS -- Continued

Soft name and	Depth	Pormeability			-	Shelnk-awe	Fa :	n n	6 70	nganic
much symbot			rapa fry	reaction	1	povential	K	Ţ	Killian V	halver
	Ĭπ	Inte	1 19	<u>p#</u>	DE / 5 2					F - 5
Md	D=5 5 -50	5,36 6.2	0 .3~0.18 0=0.1°		2	4° p %		5	4	g mili
Wendie	0-5 5-60	0.76-0 2	0	-	3	d-8 h	21.58 31.58	5	A	1 5
We, Wp-	0-5 5 36 36-50	0.2-3.5	7.39.0.27 03-56 0 0.1	6 1−1 5	2 - 5	H GREEK		٥	ь	3.4.6

<sup>\*</sup> See description of the map unit for composition and behavior characteristics of the map unit.

#### TABLE 17 .- SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brist," "apparent," and "perchad" are explained in the test. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a convers or that late were not estimated]

Soll name and	Bydro-		004178		Hig	h water t	arlo	Bo	lrock .		Hick of	durranten.
map symbol	1 gir	Frequency	Suration	Kontha	Depth	Kind	Montain	Depth	Hardness	Potential Frost action	Uncoatel	incre*e
					PE			19				
Artesian	D	Rвге			9,3-6,3	Apparer s	00t-Ju1	ráu		.9¥ +	~\$ KD	Roderstn
BeB, BeC	đ	Non-e			>6.0	-		>60	-	Low	High	Hoderate
Beadle	c	Kons			>6.0			>60	_	Low	Kieh	Nodersta
Jersond	b :	None			16.0			160			R16	1
Betta	В	None	week.	1	>6.0		1					
						*		150	****	Moderate	16,	, No Jerate.
Java	В	None			>6.0	***		>60		Hoderate	Righ	Moderate
Ban Ban		Hare	_	—	>6.0			>60		Moderate	Moderate	Low.
Bon, occentorsity fronded	В	Granstonni !	Brief	Apr-Oct	2.0-6.0	Apparent!	uct-Tu.	b.		nigh	Moderate	lo≡.
Ros, rereay f.coded	9	Bara			>6.0		1	>60		Hoderate	Hadaman	lrau
Bullareek	0	Norte	M-4-0-		>6.0			>60		Lov		1
Carter	D	Hone			10.0			-60		, OHHO,	High	Majorate
pe .		1							1	1		
Carter	Đ	Hone		1	>6.0			>60		Lov	Rich	Hoderste.
Promise	0	None		[	>6.0			>60	1	Lon		
pell .	Ī			Ī					1 [			,
Chyo	2	Hone			>6.0			>60			· gl · -	M innate
Jeragld	D 1	None		]	>5.0		1	>60			gimenan	Mosemate.
ght Changian		W				,						
Chantler		Kone			>6.0		- 1	10-20	Soft [	Low[	High	Moderate.
Sangaro	D 41	Non			>6.0	!		0-20	Soft	08***	p* mana	M PAPE
e to		4										
or Irey		None		1	>6.0			>60		(a	El gh	Koderate,
Enwine	B	Kone	1		>6.0			>60		todorate	KLED	Moderate.

	)		Pinuding .		] Hig	h water "	able	B#	the k		Rink J	s areaton
Soi. name and map symbo.	ayino- g'c		Duration	Months	Depth	Kind	Mo atta	Jepsh	Hardness	Potential frost   action	1	Concrete
					Pt			In In			1	
Jerauld	 	None			>6.0			>60		tav	Blgh	Modernte
7 - D			]					1				MODERNI
De mont	Ð	None			26.0			>60	-	Low	Noderate	Low.
Dorha	b	No rie	-		>6.0			>60	-	Moderate	High	Hoderate
Durratein	Ð	Occesional	Brief	Apr-Ort	0-1.5	Apparent	Oct-Jun	>60	traine	Hoderate	High	High.
Eakin	8	Noba			4.0			./.				
			1		-6.0			>60		Moderate	High	Moderate
DeGray	D	None			>6.0		<u> </u>	>60	-	Low	High	Moderate
Egas	5	Occasions.	Brief	Apr-Dat	0-++0	Apparent	net-Jun	>60		High	High	Moderate
Eges Vaciant	p	Prequent	Priof	Mar-Oot	*1-3.0		Jan-Dec	×60		H1gh	High	High.
8	D	Rare			3.0-6.0	Apparent	oct⊷Jun!	>60		Noderste	hlgh	Moderate
oF, QeP	с ,	No ne			>6.0			>60		70R	High	Hodorate
hA	В	Kone			>6.0			>60		Koderate	High	Roderste
Khe	± ·	None			>6.0			<b>&gt;</b> 60		Moderate	Kigh	Rodora te
Java	19	Non g			>6.0			>60	I I	Koderate	High	
gat the			1								and the same of	Productate
Highmore	5	None			26.0			>60		Moderate	High	Low.
Java	B .	None			>6.D			×60		Moderate	Bigh	Moderate
na* Highmore	B	None			>6.0			>60		Moderate	High	Low
lobridge	29	Orcastons.	Yery brief!	Ook-tue	16.0			>60				
B		Nang-	700		×6.0			SQ-40	1		High	
Lister	D	None			>6.0			20-40	Soft	70)A	High	Moderate
Slickspots.												

TABLE TO	1.77	NO.21	e la fo	MARKET PARTY	mer a Metro text	-Continued
487146	4 1 4	등등의 내고 그	ALC: U	RA LER	PARKUNDS-	

			1 12		High	h water t	able	Be	drack		Pian 7	Tree and
ረጎ, ለጸግብ ል 1 ከሕር ተጋጉኮ ፣	Ryle -	Proquency	Duration	Months	Depth	Iti nd	Months	Depth	Rardness	Potenthau 're ad	0.00	name rene
					h			In				
2 5	B	Копе		-	>6.0			>60		Noderate	-145	- Moderate.
40 * * 3	Б	Morre			>6.0		i — i	>60	_	Moderate	p3 + 12 +	Miderate.
Tg *I				Ī								
1/8	fi !	None	adhabata		1 >6.0			>60		M Serate		Muderate.
] enter	14	No sur			16.0			>60	-	Moderate	1164	- Muderatu.
Kn p	1	None		-	+.5-1.5	Perched	Apr-Jun	>60		Mulerate	T. Slives	- Moderate.
1 to 19	ť	Hara			>6.0			>60		V#	<sup>4</sup> H <sup>2</sup> gf—	. Moderate,
ar÷ ····································	f	hare		F	>6.0		1	>60		Lon-	High	- Moderate.
Parmanant h	D	6ara		+	4 frah	Ayparent	n+-yur	rbu		Moderate	n grav v	. Muderate.
na, Hammana	T4	Norm		***	6.0			190		Relevate	M ; erate	.Ar¥ ;
PER PROPERTY	В	None			>6.0	-	1-	>60	1	Moderate	High	- Low.
Marchane Marchane	C	Wone			>6.0	-	1 1	>60	1	Law	High	- Low.
Vha. Hus. Mt	:	401.0			6.0		**-	ъč		JUNEAU	10 g 10	- Mederate.
Mobridge	Б	ectalosa.	ery brief	kt="en	0.0		·	>b	dar-serve	Moderate	-14	- ANG
w <sub>E</sub> 6								,		V. 1 1	•	
Mubri government			ier, brief					٦٢.	-		1 6	
P HMX n Character		Scheller	^			Per fel		76				- Maderate.
Onte	ъ	Hone!			>6.0		1	>60		Lov	Moderate	Low.
1.4	В	tione			6.3			76.		<u> </u>	Mode Pate	40 W a
Delmont[	В	None		I I	>6.0	1	1 [	>60	]	Low	Moderate	fLow.
Cap- icaton	р	Hone			1 >6.0		-	8-20	Soft	Low	High	-[Righ.
F		Sections			6.0			60	1	WOME AND I	CLE	- Moderate

0.41	4.0		L> Hrg		digi	water 1	ab e	File	Ir i			7 C 0 0
Soil mame and map symbol	Rylan-		Duration	Nontain	Depth	Rind	Months	Dapth	Hardon		Uncoated	Comprete
	Resub	1			Ft		-			action	atec.	+
2mb, 0m2	2	Notionan and	10-14-4		16.0			20-40	Sofe	Low	H1gh	- Moderate
₩ Pa	ь	None			6,0			20-40	Soft	[Lov	Kigh	-  High.
Or. Orthents		[			(							
Orton	В	Hone	-		16,0			>60	1	Low	Low-	-  Low.
0*E*-	н	thone			6.0			61	·	W #=====		- AH.
Schumber	A	! Konge			6,3	+		+60		4 9	H je ste	y 44
Pa	:	None			+1-4 0	Per ned	Mar-Ju	.60		*Movemese	Hadr .	Yaderate.
PrA, Prb Promise	D	No na			>6.0			ļ >60	1	Low-	High	-]tow.
Hell Rebassion	* B	Nongerstand	•		>6,0			60		Hogerate	117	LOW.
Nock outerop.												
Santarquesas	D	Hone			>6.0			H-50	Soft	A Mare 444	Lgh	Моделаце
Sare, Sare	Ð	None			60			42,	o It	Popularia.	.,1	Waterson.
Ope1	D	None			26.0			50-10	Soft		الم المراق	M decates
Try	A	Nones			· 6			60		.u, ≅=====	Nederite	e We
SdP	8	Non-			>5.0			>60		Malerate	high	je
50C*, 50E* Sully-	8	Nor name of		4b-b	b. 0			63		M casmara	n p) ====	
[AMPY	Ð	Nore			6,0	+ 1	1	60		Mclenate	V. pergite	,A, W
Seet Sully	h	None			>6.0		1	) >60	1	Moderate	Righ	low.
Schamber	A	Nane			6.0			n-ú		1,000	ModePake	- W
na, has, har	a	Nanga - sauce			ь.¢			71 C		Rollerate		

五年 64、 五	 	AMD	母亲 丁姓氏	MEATINES.	Continued

	1		1 146		1 4	pater t	AP LE	ð-	- 4	· · · · · · · · · · · · · · · · · · ·	Piak of	corregion
Sol, name and map symbo.	Hydriu gta grass		Darwiton	Kontha	Septh	IC\$ rid	Months	hepth	annineus	forentie. front ent. m	'ncoated	Concrete
				4	P1.			in				
d- <del>vanasseria</del> kendte	t	Harrensen		:	6.		ì	/60		-08	High	Low.
Kud is	L	crasiona.	Betefore	Aprelet	9-3			60		~×=====	#1gA	-019
worthing	I	No 10-	*	1	4441-3	Per red	, life where the	6.5		:47 K*******	algh	Holerate
parameter ng	· c	Yane		'	+ 3= -, 4	Per-rel	unan-Ger	E 7		нідання	Righteen	High.

<sup>·</sup> ea description of the map unit for complete on and behavior stars terration of the day unit

TABLE IS .- ENGINEERING INDEX TEST DATA

FDuches indicate that data worm not available. LL means signed limit, PI, pushficity index, ND, maximum dry density; and OR, optimum moisture?

Sati man	Clausif	1021100				ise di	atrii	outlor					ture sity
Soil name, horizon, and depth in inches				Fer-	ng ele	ge cve	Per James	ler t	age han		PI	_	**
	AASHTO	Jairted	Ho .	No.	No 40	\$00 No.	-02	005	-002				
Settys clay tons	1		,				1			Pot		Tt.	3 Pes
CH214 to 10	A-7-6(17) A-7-6(19)	CH	97	95	85	71	=	35	-	52	26	29	22
Glenban loam 6°4 to 11 Ck16 to 28	A-6 12) A-7-6 16,	CF CF	99	9A 96	9.	70 71	1 10	31	-	44	21 28	1 42	2 4 >2
Highwore silt losm: Ap0 to 6 Pt6 to 21 Ckl26 to 38	A-6(10) A-7-6(19) A-7-5 13	71. 71.	-	100	100	98 98 98	=======================================	31 37 37		80 93 42	16 20	96	20
April 10 to 7 Binner to 11 Ckeep 38 to 51	A-6 8 A-8 A-8 A-8 A-8 A-8 A-8 A-8 A-8 A-8 A	ML ML CL-ML			100	99		17		32 32 28	, 7 4 8 1 7	104	20
Mobridge eilt loum: A to 15 Bt 15 to 29 Ck +35 to 60	A+7-6 11 A-7-6 18 A-7-6(19	MI, CH CH	98	100	98 98 91	93 94 75	==	37 51 46	=	45 54 53	28	86	10
Othe loam Apress 0 to 4 BH to 14 2024 to 60	A-7 5 9 A-6 7 A-1-8 D;	ME IT SW-80	100 95 56	99 92 96	82 59 21	71 53 8		17 21	-	45	.1	91	26
Just slity clay: A	A-7-5 (20. A-7-5 20	CH CH	=		100	98 99	_	59 77	=	67 86	30	88	32
Promise silty clay Ap0 to 7 Br7 to 19 Cy47 to 60	A-7 5 20 A-7-6 20 A-7-6 20	CH CH		==	100 100 100	98 99 99	111	53 61 59	=	62 65 69	31 37 45	85 92 95	31 26 24
Her loam A	A-7-6 10, A-7-6 1, A-7-6 12 A-6 11	CL CL CL	97 97 96	94 90 95 92	84 75 86 80	79 67 79 72	=	22 24 30 25	=	42 43 40	1 n 20 21 21	95 105 110 112	24 19 17 16
Sriumber .omm A0 to 3 C3 to 20	A-2-7 0 A-2-4 0	5H 5H-5H	95 75	87 64	57 27	35 12		13	=	44 36	12	105	19
Ulf milt loam A:0 *0 6 Bx9 to 17 Ck23 to 55	A-4'8 A-6 10, A-6 10	ML ML CL	=		100 100 100	98 95 98	=	23 25 33	=	34 38 38	8 14 16	100 100 106	22 22 19
Wendle stity clay A1. A2-0 to 5 Fi. C2.	A=7-6(20)	CIL		100	99	84	_	37	_	62	31	68	30
C35 to 40 C440 to 60	A-7-5 20 A-7-5 20	CH TH	***	100	99	38 89		55		A6	5. 17	59 10	28

TABLE 19. -- CLASSIFICATION OF THE SOILS

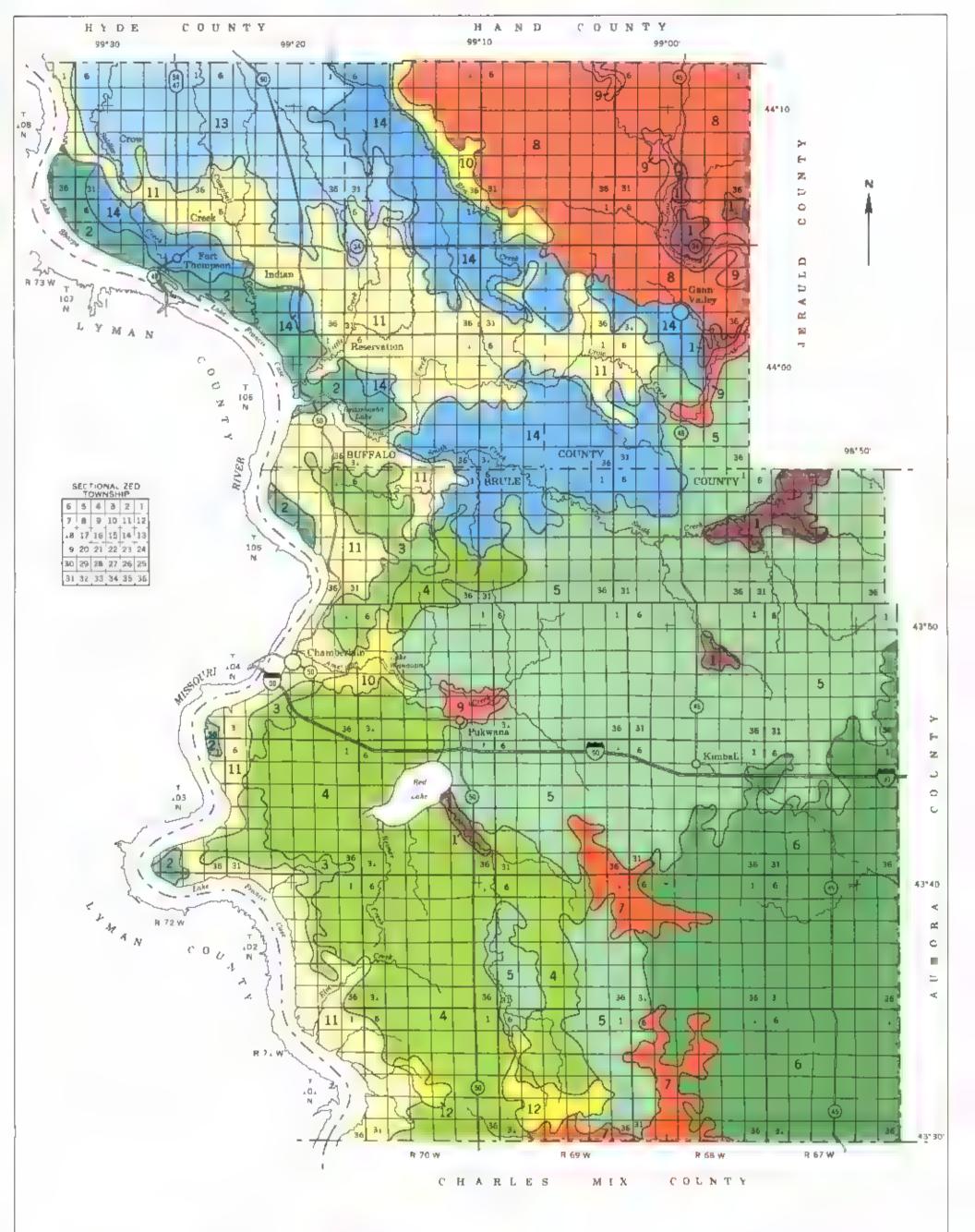
Soil name	Family or higher texonomic class
Arresian	Fire, montmarillon'itc, mesic Vertic Replustolls
Teat communication	Pine, montmortilanitia, mesio Typic Argiustolla
Re's n	Fine-loamy, mixed (calcureous), ments Typin Untorthenta
Herenesenses was the	Pine-loamy, mixed, means Cumulin sappustonia
P. Trek	Very fine, series, series ver to har ustoles
180000	Very fine, montmortllonit . mean Vertic Palcuntons
4 /	Pine, montmorthlonitic, and r ', Narrupte, s
frart, er	typy, minimit' of ', n a through , menic, aballow bile Torriorthenia
[ m x m y m m m m m m m m m m m m m m m m	P' e, man a ri. n't , seat 7, c batewater. a
for miletaracountermount	Pine-coary over early remarks have class mixed, mesic Typic Haplustolla
9 FT No	Conrec-silty over clayer, sixed, mesic Fluventic Haplustolle
Amate Garante Comment of the	Pine, montmorillonitia, mesic Typic Matraquolia
Fai	Pine-silty, mixed, meals Typis Argustoils
h	Pine, montmortlionitie (calcareous), meste Typic Saplaquella
F272 - 122 122	Fine, mesic Typic Calciaquolls
Paragori	Pine, montmorillonitie, mesic Typic Matrustolls
P 1/ 1	
4 815	Pine, montmorillonitis (salcareous), mesis Typic Ustorthents
1 2 5 12-	Fine-Isany, mixed, mesic Typic Argiustolla
tat examination	Fine-silty, mined, menic Typic Argumetolis
*Acha-	Very fine, montmorthlocitic, mesic Leptic Natrustails
	Fine-loamy, mixed, messic Entir Haplustolls
Yo . 3	Fire, montmorthlonitic, mesic leptic Matruatella
	Very fine, montmortillocitic (calcareous), masic Vertic Haplaquoita
ACENALANA IN .	Fine, wontmortllenitie, mesic Pachic Argiustolia
#19-4 A	Coarun-silty, mixed, music Typic Raplestalin
loury carlastones	Coarme-loamy, mixed, meste Typic Haplustolla
M 25000000000000000000000000000000000000	Fine, montmorillonitie, mesic Typic Arglustells
¥ 1 11- T- T-	Pine, montmorillonitic, mesic Vertis Argustolis
W: F: 128	Pine-milty, mixed, mexic Pachic Arguetolia
A Personal and a second of the	Fine-loamy over sandy or sandy-skeletal, mised, meste Typic Rapionto is
NEG 10	a syny, monthort of this call are in , menor, shallow Typic atoetherita
*	Pine, menteerillenitie, menie Vertie Argiustolis
131 - + +	Very fire, minimum, make, music Vertic Hapkuntolis
happing and and and and and and and and and and	Loars, disci, recic y, ' scorthente
`T'	Coarse-lowny, mixed, men! Typis Haplustolls
Pare's standard	" no, montportilentic, mente Typic Arginibolis
Prazist	Very fine, montmorillonitic, meals Vertis Haplustolls
Ree	Pine-loamy, mixed, meets Typi Argiusto :
P4 89"	Clayer, montmortilionitic (calcare) a , mesic, shallow Typic peterthents
References and the second	is proceeding mined, were site Torrigetherts
4. Processes - the several	paragrait, aimed calcarevis, ass's Typic Ustorthents
y	Pine-silty, mixed, meale Typic Happystolls
der it comments	Fine, montaorillonitis (calcareque), mesic Vertic Ustifluvents
Aonth's Service	Pine, montmorillomitic, mests Typic Argiaquells

\*The months is a "aunithment to the series. See text for a description of those characteristics of the series are outside the range of the series.

## Accessibility Statement

This document is not access ble by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at <a href="ServiceDesk FTC@ftc.usda.gov">ServiceDesk FTC@ftc.usda.gov</a>. For assistance with publications that include maps, graphs or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at <a href="http://offices.sc.egov.usda.gov">http://offices.sc.egov.usda.gov</a>, ocator app

The U.S. Department of Agriculture (USDA) prohib to discrimination in all its programs and activities on the basis of race, color inational origin, age id sability, and where applicable sex, manta status familial status, parental status religion sexual orientation, genetic information, political beliefs, reprise, or because all or a part of an individual sincome is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille large print audiotape, etc.) should contact USDA siTARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA ibrector. Office of Civil Rights, 1400 Independence Avenue SiW. Washington DiC. 20250-9410, or ca. (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.



## SOIL LEGEND\*

NEARLY LEVEL TO ROLLING LOAMY SOILS UNDERLAIN BY SAND AND GRAYEL. ON OUTWASH PLAINS AND TERRACES

Oake-Delmont association. Well drained and somewhat excessively drained, nearly level to rolling loamy soils that are shallow or moderately deep over sand and gravel, on outwash plains and

NEARLY LEVEL TO STEEP SILTY AND LOAMY SOILS ON UPLANDS AND IN UPLAND SWALES

Uly association. Deep well drained nearly level to

Highmore-Java-Gienham essociation. Deep, well

Lowry-Sully association. Deep, well dreined, nearly level to steep, skilly soils on uplands

moderately sloping, stilly soils or uplands

Highmore-Mobridge essociation. Deep, web drained and moderately well drained nearly level to gently rolling stilly solls on uplands and in upland swales.

drained, nearly level to gently rolling, silty and learny soits on uplands

Fakin-Delicey association. Chang well drained and

Eakin-DeGrey association. Deep, well drained and moderately well drained nearly level and gently undutating silly soils on uplands.

SOILS ON UPLANUS AND IN UPLAND
DEPRESSIONS

Boudle-Plankinton-Eakin association: Deep well

LEVEL TO GENTLY ROLLING LOAMY AND SILTY

Beadle-Plankinton-Eakin association: Deep well drained and poorly drained, level to gently rolling, learny and silty soils on uplands and in upland depressions.

Grenham Jave-Highmore association: Deep well direction, nearly level to gently rolling learny and silty soils on uplands

LEVEL SILTY SOILS ON FLOOD PLAINS

Durrstein-Egas association Deep, poorly drained lavel, silly soils on flood plains

GENTLY SLOPING TO STEEP CLAYEY AND LOAMY SOILS ON UPLANDS

Betts-Java association Deep, was drained strongly stoping to steep, learny soils on uplands

Sanserc-Oper-Chantier easociation. Shallow and moderately deep, well drained gently stoping to

steep clayey soils on uplands

Okaton association. Shallow, well drained moderately steep and steep clayer soils on uplands

NEARLY LEVEL TO STRONGLY SLOPING, CLAYEY SOILS ON JPLANDS

Oper serine-Promise association. Moderately deep and deep well drained nearly level to strongly sloping clayer sorts that are dominantly saline, on uplands.

Promise-Opel association: Deep and moderately deep, well drained hearly level to strongly sloping, clayer soils on uplands

\*The texture terms in the descriptive headings refer to the surface layer of the major soils in each association.

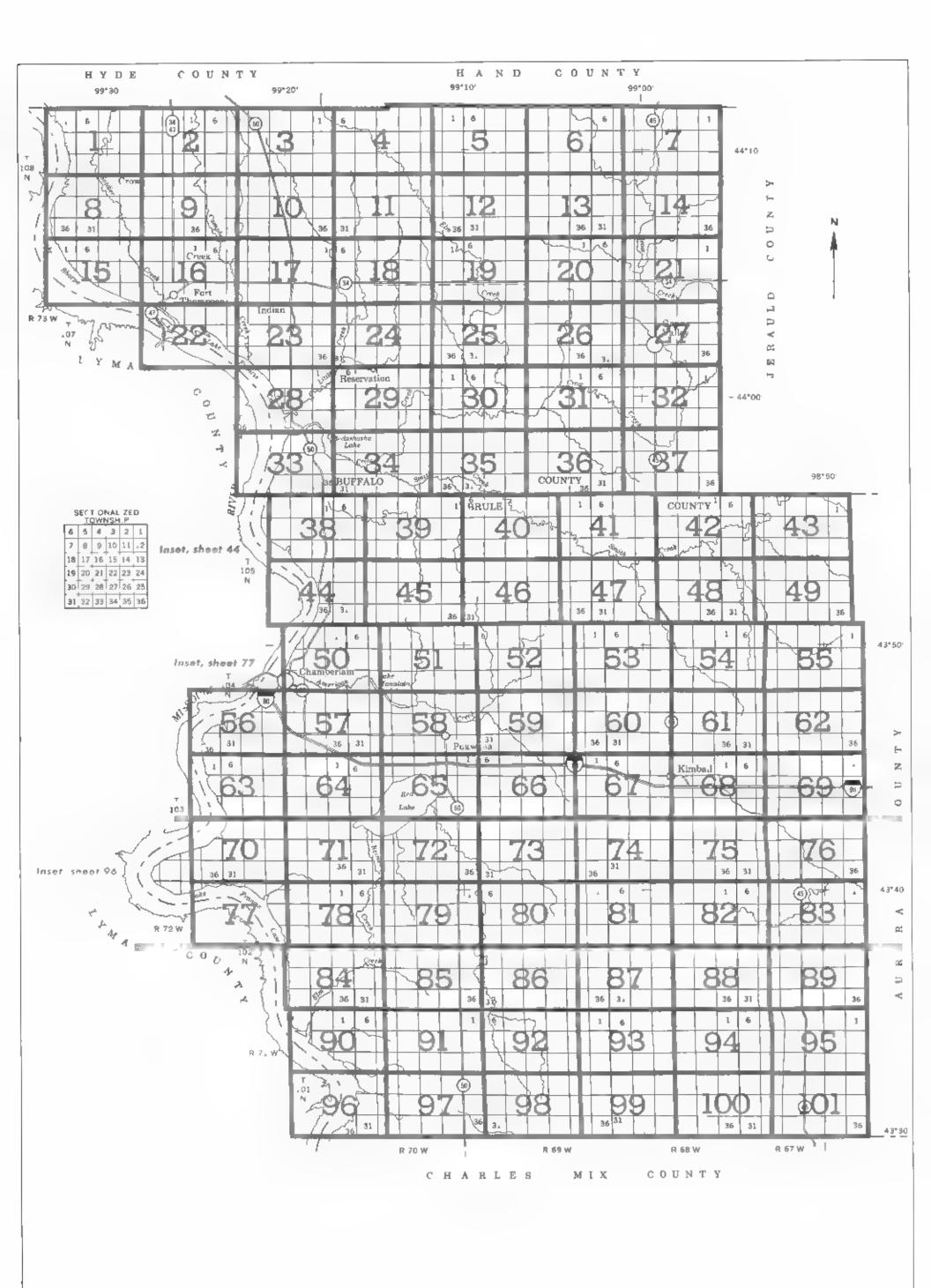
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
J.S. DEPARTMENT OF THE INTERIOR
BUREAJ OF INDIAN AFFAIRS
SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA

> Scale 1:253,440 1 0 1 2 3 4 Miles 1 0 4 8 Km

Compiled 1983

Each area confined on the map contains of their than take kelo in solo — the thap it thus megas his general planning cupter chain a deplifer decrease por the sole of opening reservi-



INDEX TO MAP SHEETS
BRULE AND BUFFALO COUNTIES,
SOUTH DAKOTA

Scale 1 253 440 1 D 1 2 3 4 M es 1 0 4 8 Km

## **SOIL LEGEND**

Map symbols consist or a combination of lotters. The firs inapidal teller is the indianone of the map unit name. The lower case letter that follow separate map units having names that begin with the same letter except that it does not separate sloping phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellandous areas.

YMBOL	NAME	SYMBOL	NAME
		7 7 11	
Ar	Actesian sitty day fram	Ma8	McClure sit foam, 2 to 6 perceix stopes
		MaC	McClure silt roam. 5 to 11 percent slopes
BeB	Beadle loam 2 to 6 percent alopes	MpA	Maliboro silty clay team. O to 2 percent slopes
BeC	Beadle foam 6 to 9 percent slopes	MbB	Mulboro silly clay loam. 2 to 6 percent slopes
BgB	Beadle-Jerauld complex. 1 to 5 percent slopes.	MbC	Millboro silty clay foam. 6 to 9 percent slopes
6mF	Betts Java loams 20 to 40 percent slopes	MoA	Mobredge sift loam
Bn	Bén igam	Mip	Mobridge-Plankinton silf loans
Ba	Bon roam channeled		
Bu	Bulltreak clay	Oa	Othe loam: 0 to 2 percent sloves
		ÓdB	Oake Delmont werns, 2 to 6 percent sippes
Ca	Carter sitt loam	OwF	Okaton bouldery sety clay 15 to 40 percent slopes
Cp	Carlei -Promise complex	ONB	Oko loam. 2 to 2 percent alones
€r	Cave-Jerauld self teams	OmB	Opal selly day 2 to 6 percent slopes
CVD	Chamber-Sansard clays 2 to 15 percent slopes	QmC	Opel salty clay 6 to percent slopes
		OpB	Opal clay saline. a le 6 percent slopes
UBA.	DeGrey-Ealon-Jevauld sitt loams, 0 to 2 percent slopes	O <sub>1</sub>	Oribents, loamy
DelD	Delmont team 6 to 15 percent slopes	Otal	Ortan Idam. 0 to 2 percent slopes
Do	Dörna silt ágam	OIB	Orton loam 2 to 6 percent slopes
Du	Durretein sill toam	OwE	Orlon-Schamber learns 9 to 25 percent slopes
EaA	Eahin DeGrey sitt learns. D to 3 percent slopes	Pa	Plankinton silt loam
Eg	Egas pilty clay loam	PvA	Promise salty clay i0 to 2 percent slopes
Ew	Egas Variant silly clay loam	PrB.	Promise safty clay 2 to 6 percent slopes
Ea	Edmissionth saft loam		
		ReA	Realigam, O to 3 percent slopes
GeE	Gettys clay loam, 9 to 25 percent slopes	RuB	Ree loam: 3 to 7 purcent slopes
GeF	Gettys day toam, 25 to 40 percent slopes	ReF	Rock outcrop-Santary complex 15 to 40 percent slopes
GhA	Glenham loam. If to 3 percent slopes		
Glk B	Glantiem Jewi Ioams, 3 to 6 percent slopes	S#E	Sansarc-Open clays, 12 to 20 percent slopes
		SaF.	Sansarc-Opal clays, 20 to 40 percent slopes
HgB	Highmore-Java complex. 4 to 5 percent slopes	ScE	Schamber toam, 9 to 30 percent slopes-
HgC	Highmore-usiva complex: 5 to 9 percent slopes	SdF	Sully saft team 25 to 40 percent slopes
Hmå	Highmore-Mobridge sill loams 0 to 4 percent alopes	SoC	Sully-courty sitt learns, 6 to 9 percent slopes
HoB	Hurley silt toam, 0 to 6 percent stopes	SoE	Sully-Lowry silf loams 9 to 25 percent plages
HisA	Hurley-Slickspots complex, 3 to 4 percent slopes	SsE.	Stilly-Schambar complex, 9 to 25 percent slopes
JISE	Java-Betts roams i9 to 20 percent slopes	Neu	Uly self-loam. O to 2 percent slopes
JeC	Java-Grenham feams, 6 to 9 percent slopes	Ua6	Uly salt logum. 2 to 6 percent slopes
		JeC	Jly sitt loam 6 to 9 percent plopes
Ke	Kolis salty clay		
		Wd	Wendte silty clay
1.0	came sifty day loam	We	Wandle Silty clay channeled
al .	Lame-Farmsworth sift fooms	₩o	Worthing salty clay toam
LDA	Lowry sift learn () to 2 percent slopes	₩p	Worthing salty clay loam, ponded
LoB	Lowry silt foam 2 to 6 percent slopes		
LvA	Lowery Variant self loans. O to 2 percent slopes		
E4B	Lower Variant set loam 2 to 5 percent slopes		

# CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES	WATER FEATURES
BOUNDARIES	DRAINAGE
County or parish	Perenniel, single ilne
Reservation (national forest or park,	Intermittent Drainage and
Limit of soil survey (abel)	Drainage and/or integation
Field sheet metchline & neatline	LAKES, PONDS AND RESERVOIRS
AD HGC BOUNDARY (abel)	Perennisl
Small an port, arriveld, park, cellield, Dame American Commetery, or flood pool	MISCELLANEOUS WATER FEATURES
Your,	Wet spot **
STATE COORDINATE TICK	_
LAND DIVISION CORNERS sections and land grants)	T SPECIAL SYMBOLS FOR SOIL SURVEY
ROADS	SO L DEL NEATIONS AND SYMBOLS Dat Rea
Other roads	MISCELLANEOUS
ROAD EMBLEMS & DESIGNATIONS	Gravelly spot
Interstate	Dumps and other similar
Federal	non saik areat Sølmø spot +
State	Sandy spot
RAILROAD	Stony spot, very stony spot 0 (II)
DAMS	Borrow Area
Large (to scale)	Claypan spot
Medium or small	Orthonts
<u>(                                    </u>	OF WAGE
MISCELLANEOUS CULTURAL FEATURES	SEWAGE LAGOON
Farmstead, house eomit in urban areas	
Church à	

### **SOIL LEGEND**

Map symbols consist or a combination or letters. The first capital letter is the initial one or the inap unit name. The towercase letter that follows separate map units having names that degree with the same letter, except that if does not separate sloping phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for hearly level soils or miscellangous areas.

SYMBOL	NAME	SYMBOL	NAME
Aı	Artesian sifty clay toani	MaB	McClure silt roam, 2 to 6 percent slopes
		MaC	McCiure sill from 6 to percent slopes
BeB	Beadle warn, 2 to 6 percent slopes	MbA	Miliboro silty clay learn. O to 2 percent slopes
Be0	Beadle loam i6 to 9 percent slopes	MbB	Militabro silty clay toanii, 2 to 6 percent itopes
898	Beadle-Jerauld complex it to 5 percent slopes	MbC	Millboro silty day roam 6 to 9 percent slopes
BmF	Belts Java Joans, 20 to 40 percent slopes	MoA	Mobilidge self-team
Dα	Bon learn	Mep	Mobilege Plankinton will Ideans
Во	Bon learn, chapneled		
Bu Bullcreek Hav	Bullcreek rlay	Oa	Dahe loam, 0 to 2 percent slopes
	·	OriB	Dahe Delmont toains 12 to 6 percent dispes
€a	Carter silt loam	CeF	Okaton bouldary silty day 1,5 to 40 percent slopes
Co	Carter-Promise complex	OkB	Oko jauni. 2 to 7 percest stopes
Cr.	Cayo Jerauld sell tooms	OmB	Opal silty clay: 2 to 6 percent slopes
(50	Chantier-Sansard days, 2 to 15 percent slopes	OmC	Opai salty dray 6 to 12 percent slopes
A second national angle in the		OpB	Opariciay saline is to 6 percent slopes
DaA	DeGrey Eakin Jerauld sit, kiama, 0 to 2 percent slopes	Oi	Orthents loamy
ADI	Delmont toam, 6 to ±5 percent slopes	OtA	Orton toam -0 to 2 parcent slopes
Do	Dorne Sill Ioani	018	Orton parm 2 to 6 percent slopes
Dii	Durrstein sit loam	Ow6	Onton-Schainbei Ibains, 9 to 25 percent slopes
FaA	Eakin-DeGrey silt loams, 0 to 3 percent slopes	Pa	Plankinton sil: ioam
II.	Egas milty may learn	PrA.	Provinse sifty clay: O to 2 percent stopes
W	Egas Variant sulty clay to are	PrB	Promise silty clay 2 to 6 percent slopes
a .g	Farm sworth silt loam		
		ReA	Ree loam i 0 to 3 per remislopes
Cir.	Geltys day loam, 9 to 25 percent slopes	ReB	Ree loam is to 7 percent slopes
100	Gettys clay toam   25 to 40 percent stopes	RsF	Rock outcrop-Sansarc complex 15 to 40 percent slopes
Arte	Gleitham dani 0 to 5 percent slopes		-
de -	Glenham-Java leams, 3 to 6 percent slopes	ŞaE	Sansard Opaliclays   2 to 20 percent slopes
		Sah	Sansaru-Opal clays, 20 to 40 percent plopes
48.1	Highmore- lava complex is to 5 per-ent slopes	ScE .	Schamber loain: 9 to 30 gentent sigges
4194	Highmore Java complex. 5 to 9 percent slopes	\$dF	Sulfy silf loain, 25 to 40 percent slopes
Arrich .	Highmore-Mobridge sitt learns. 0 to 4 percent slopes	SoC	Sulfy-cowry silt learns: 6 to 9 percent slopes
464	furies will team iO to 6 percent slopes	SoE	Sulfy-Lowry silt loams i9 to 25 percent slopes
458	furley Slickspots complex — to 4 percent slopes	22E	Surity Schamities complex 19 to 25 percent slopes
114	Java Bells loains, 9 to 20 percent alopes	JaA	Jly sir loam i 0 to 2 percent slopes
1p4	Java-Grenham loams, 5 to 9 percent slopes	JaB	Jly sill loam i2 to 6 percent slopes
		.raC	Ulvisir loam i6 to 9 percent slopes
jk.	Kolla sility clay	du-s	INIthltl
		(Vd	Wendle silty clay
ıl.	arin ally day fram	We	Wendle silty clay ichanneled
	arm on Newton his altitooms	Wo	Wor ling sifty clay toom
·A.	vw.v. altituami. Dito 2 perceiu stopes	Wp	Workning sifty clay foam ponded
11	weivial round to a percent slopes		
Α	ow y Varian, sit, learn, 0 to 2 percent slopes		

re viva in hit learn 2 to 6 percent slopes

## CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

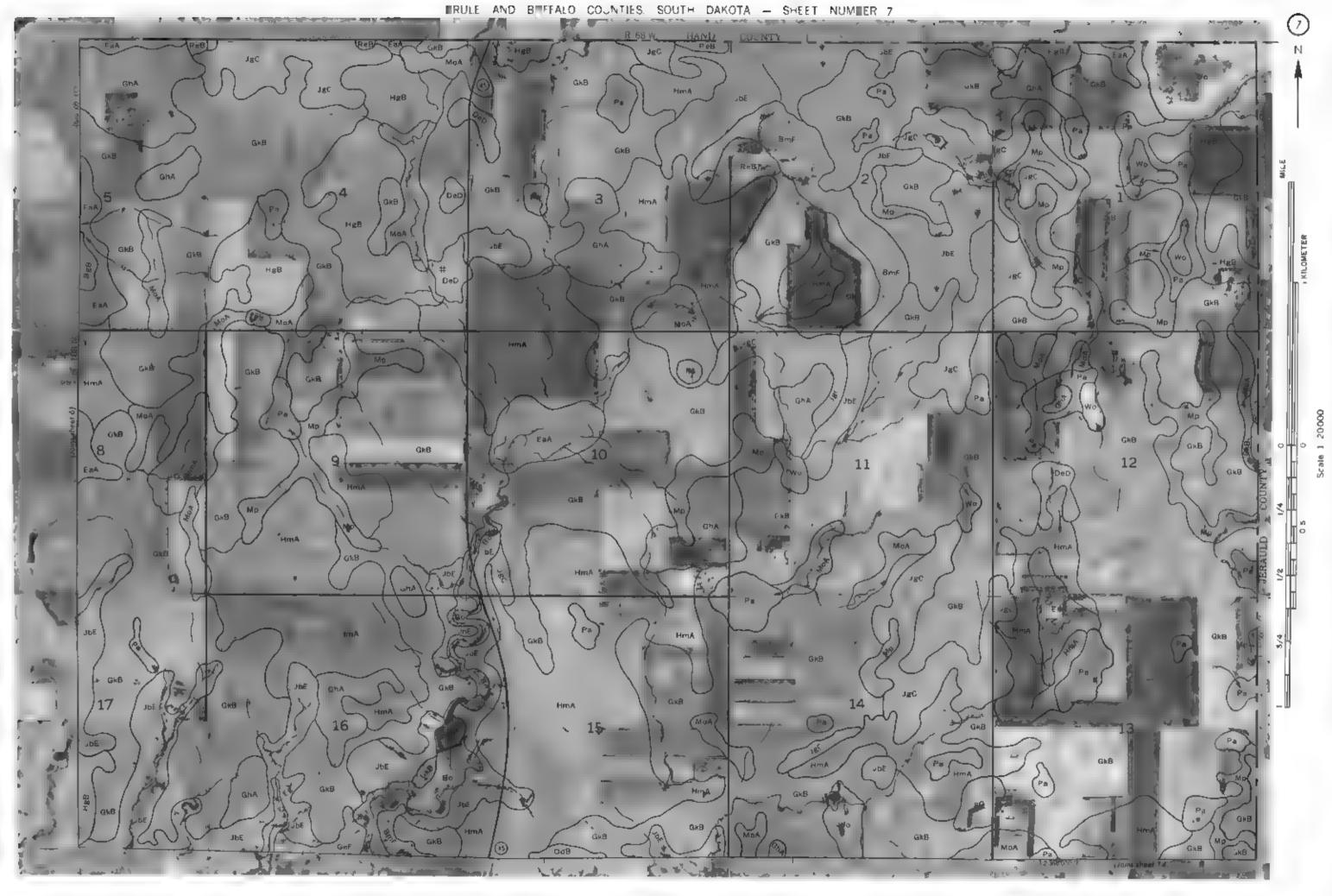
#### CULTURAL FEATURES WATER FEATURES BOLINDARIUS DRAINAGE County or partish Perennial, single line Reservation national forest of park, state forest or park. Intermittent and large airpor Dramage end cimit of soil survey habol? Drainage and/or irrigation LAKES, PONDS AND RESERVOIRS Field sheet matchline & neathins Company (a) AD HOC BO INDARY label Perent (\$) Small airport, airfield, park oilfield. MISCELLANEOUS WATER FEATURES cemetary, or flood poor Wet spot STATE COORDINATE TICK SPECIAL SYMBOLS FOR LAND DIVISION CORNERS. sections and and grants SO L SURVEY SOIL DELINEATIONS AND SYMBOLS 40 A Ph Office ads MISCELLANEO JS 40A) MF MS & DESIGNATIONS 8 Gravelly spot 3 Dumps and other simila non-sqi areas 12 Urbot state (41F) Saline spot pulpu a (92) Sandy spor 0 00 other broder Stony spot, very slony spot MAR Borrow Area <₹ cargo (to scale): Claypan spot # Mechanical grade Orthents SE WAGE LAGOON MINUTER ANDOLS CULTURAL FEATURES in institute, house direct in orban areas School

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO 2

Principle Complex or DE Earlier Management of Security Se

BRULE AND BUFFALO COUNTES SOUTH DAKOTA NO 5 FING science of transfer of transf

19 rap is compared to 1820 miles paragraph, by net 1 - Supplement of specimen for Continuous services and constraint appropriate paragraph of the PRULE AND BUFFACO COUNTIES SOUTH DAKOTA NO 6



BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO 8

SHEET NUMBER 9

BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO 10

BRULE AND BUFFALO COUNT ES, SOUTH DAKOTA - SHEET NUMBER 11

WEB SIGNED OF A A REPORTED TO COUNTY FOR SECURISH SOUTH DAKOTA NO 12

BRULE AND BUFFALO CO., NITES SOUTH DAKOTA NO. 44

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO 15 mpts committee 65 and a property species.

harmon condition of the amount of the transport of the control of the condition of the cond

BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO 27 to no accomment of the number of the num

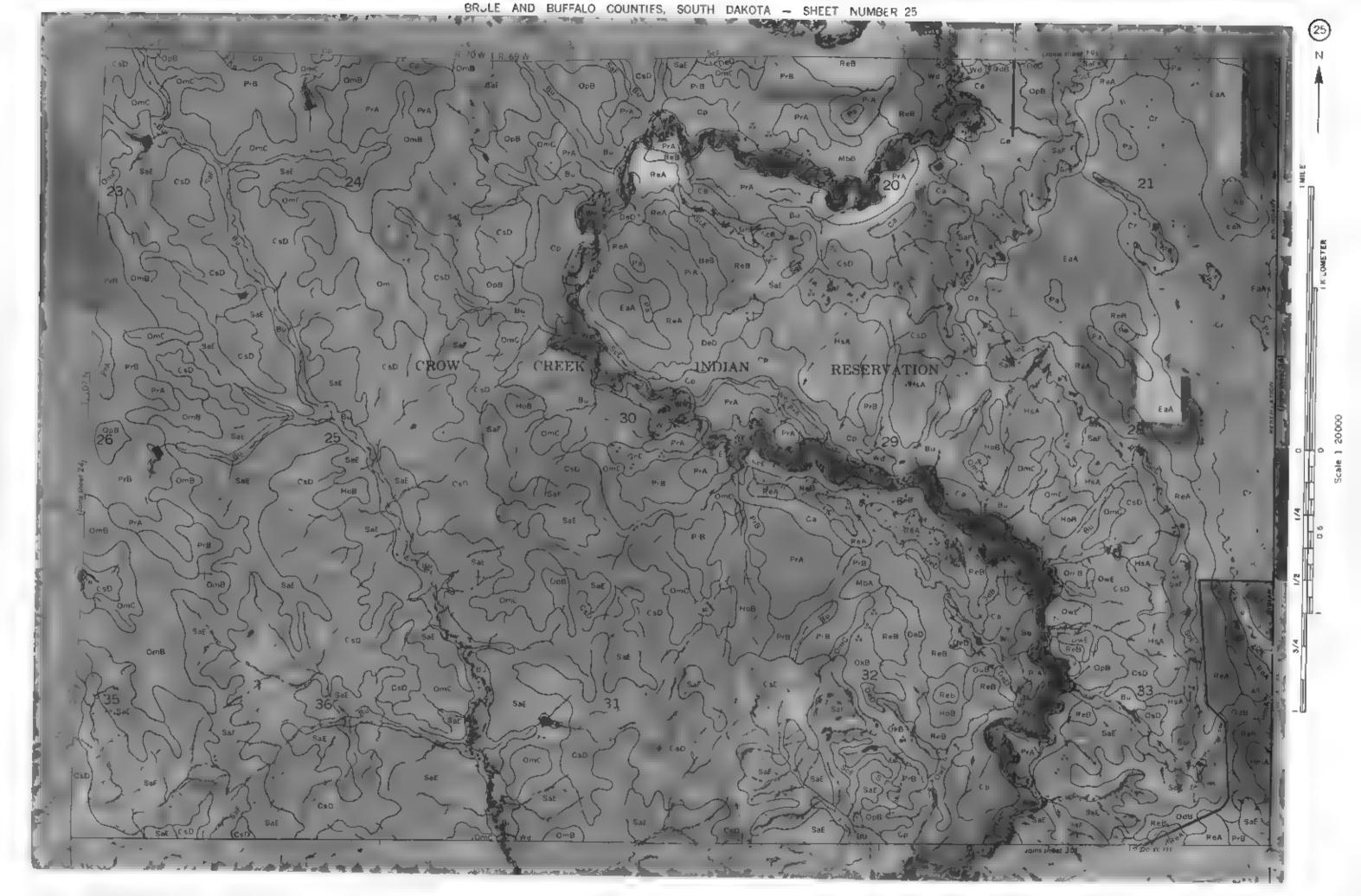
THE WASHINGTON BUTCHER OF STREET STREET OF THE STREET STRE

BRUILE AND BUFFALO COUNTIES, SOUTH DAKOTA NO assessment of throughout the Companion Source of expenditure and companion and comp

Parties a contact of 133 minus processor, in the 1 December of proceedings in a consultant forms and associate specific to the Control of the

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO 2. Its ages complete by page 15 on the Counties of

TO MAKE IT THERE HER AND SHOPE THE PROPERTY OF A PROPERTY AND THE AND SHOPE 
IN THE PROPERTY OF THE PROPERT



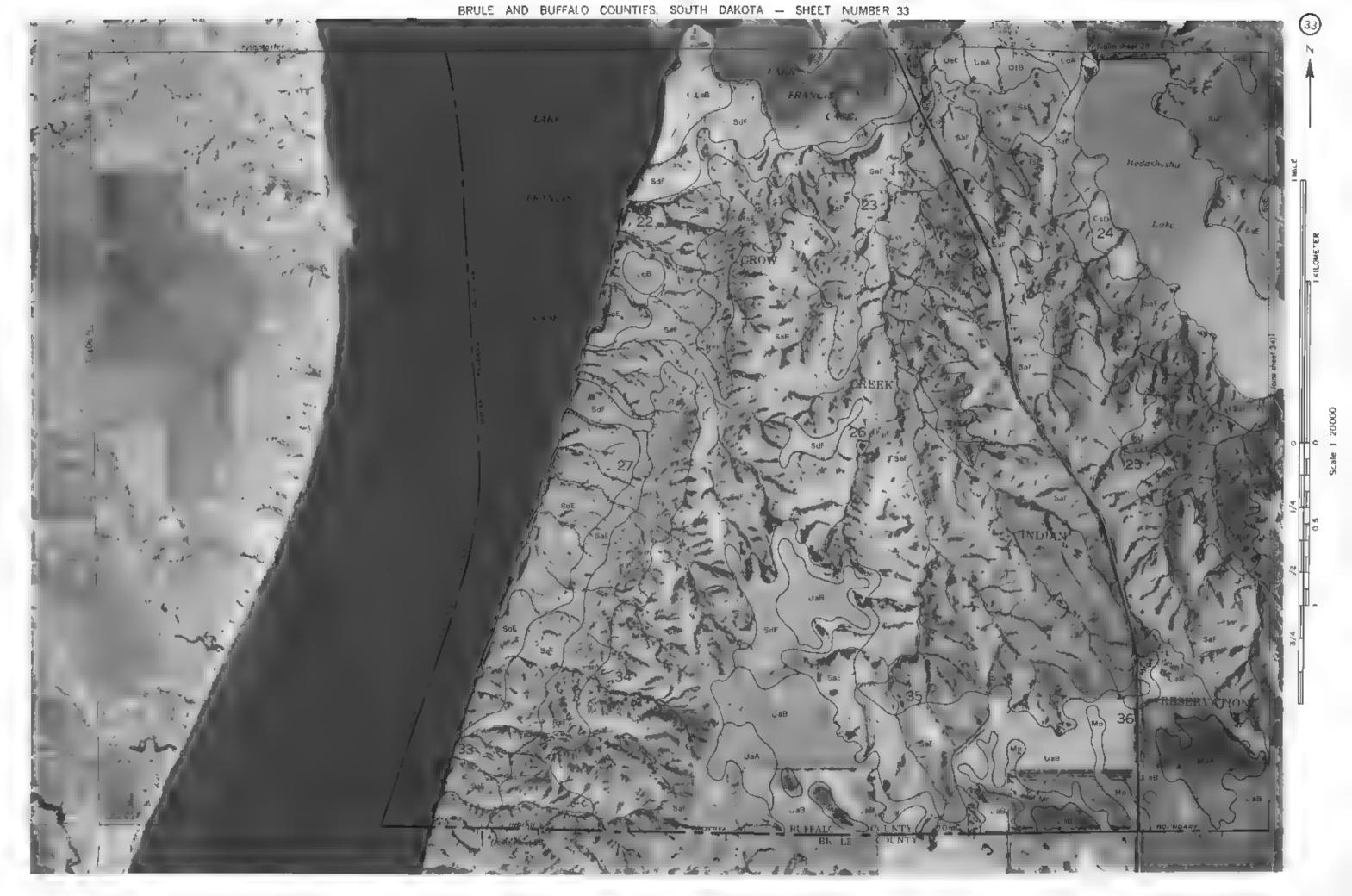
BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO 26

159 of 500 No. 31. Team proper in the Landers in American body properties and communicative and the Communicat

BRULE AND BUFFALO COUNT ES SOUTH DAKOTA NO 29 compete de l'ample en l'ample en l'ample de l'ample de l'ample de l'ample en l'ample e

TO COURSE OF BUILDING TO SEE STANDARD TO SEE STANDARD TO COMPOSE SECURIOR SEE SECURIOR SEE SECURIOR SEE SECURIOR SEE SECURIOR SEC

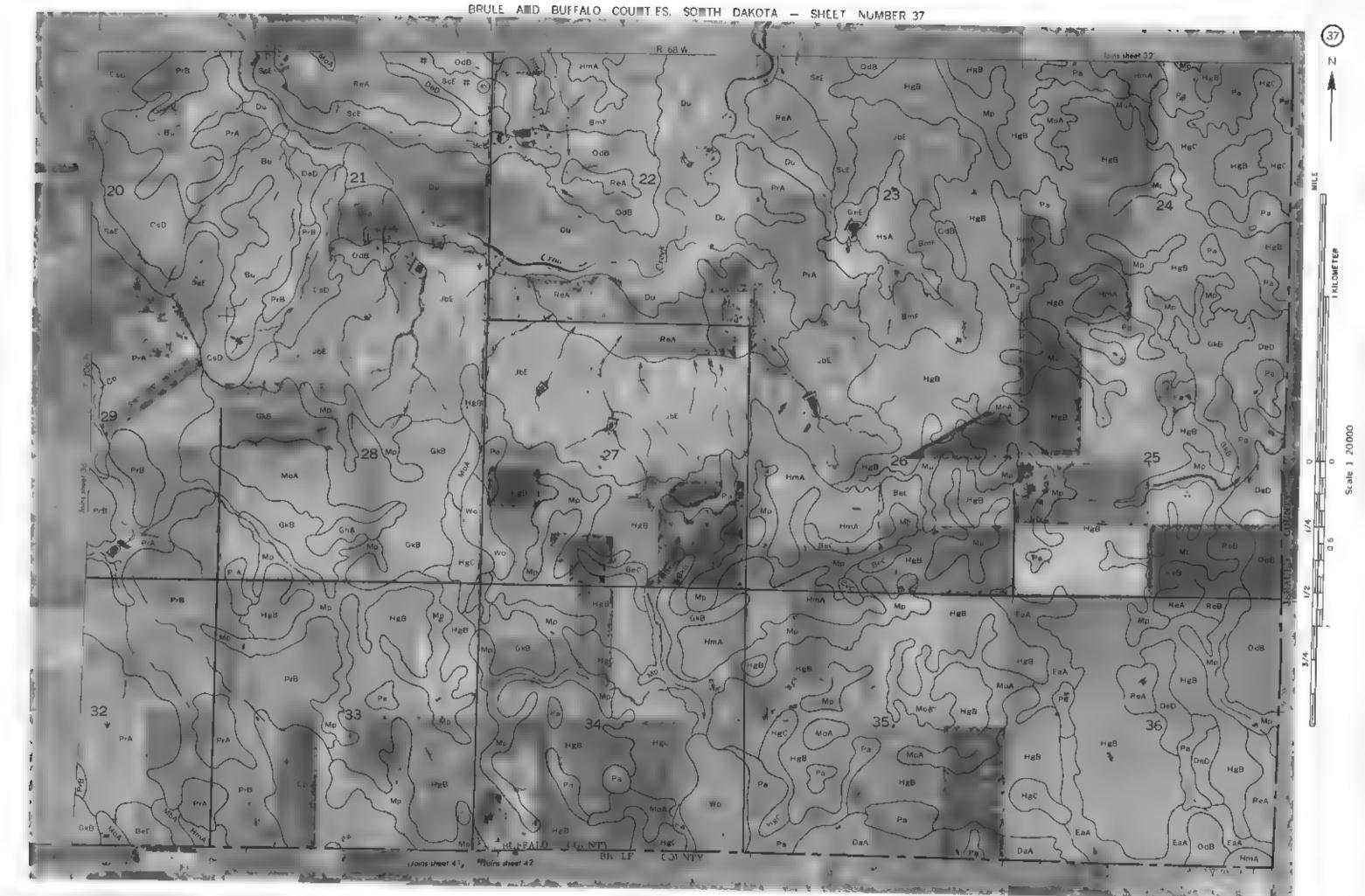
PRULE AND BUREFARM OF COUNTIES, SOUTH DAKETA NO. 32



BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO 34

BRULE AND MINISTERIO COUNTES SOUTH MINISTERIO NO 35

Compared the control of the control



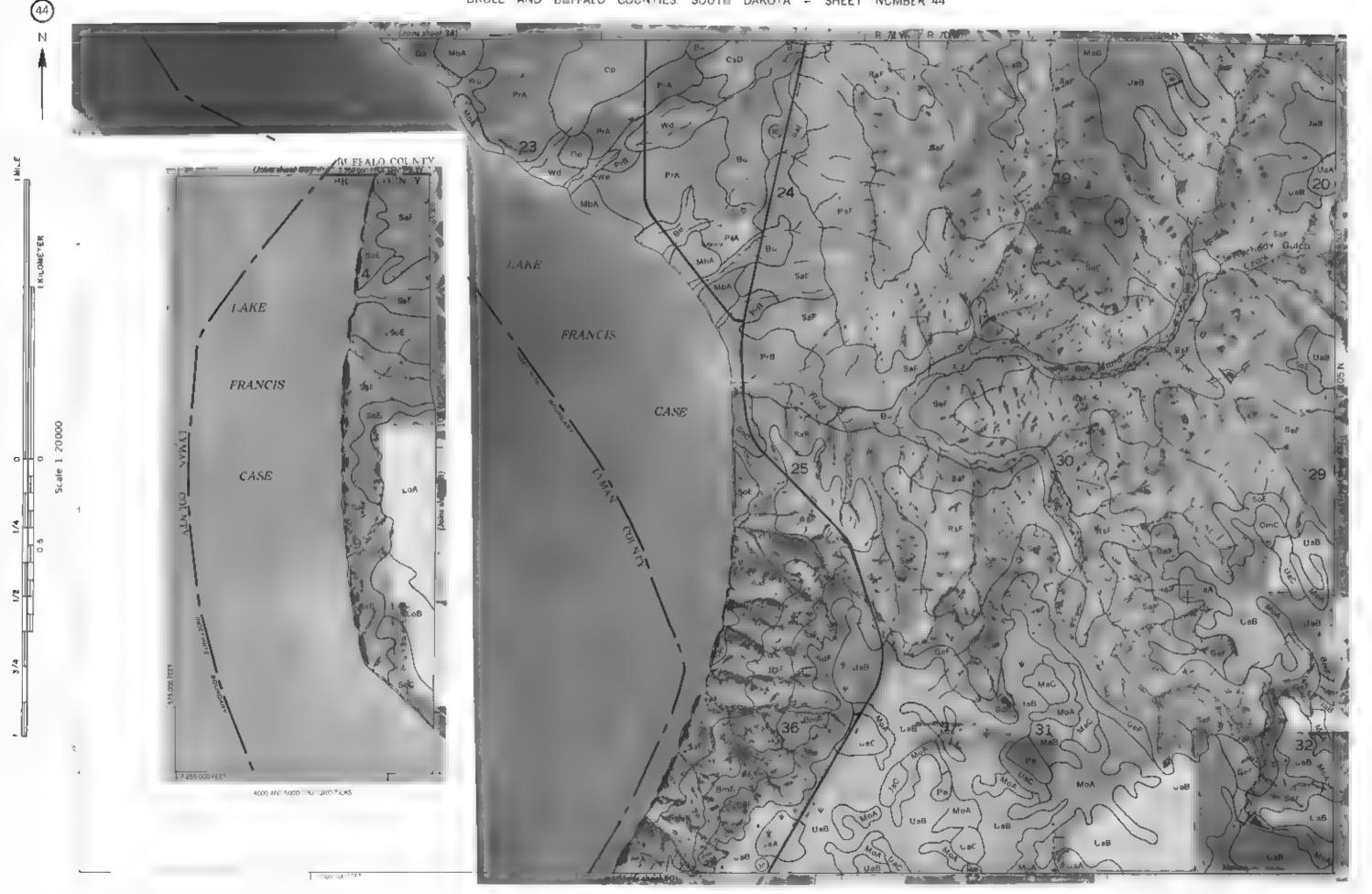
BRULE AND BUFFALO COUNTIES SOUTH DAKEN NO 38

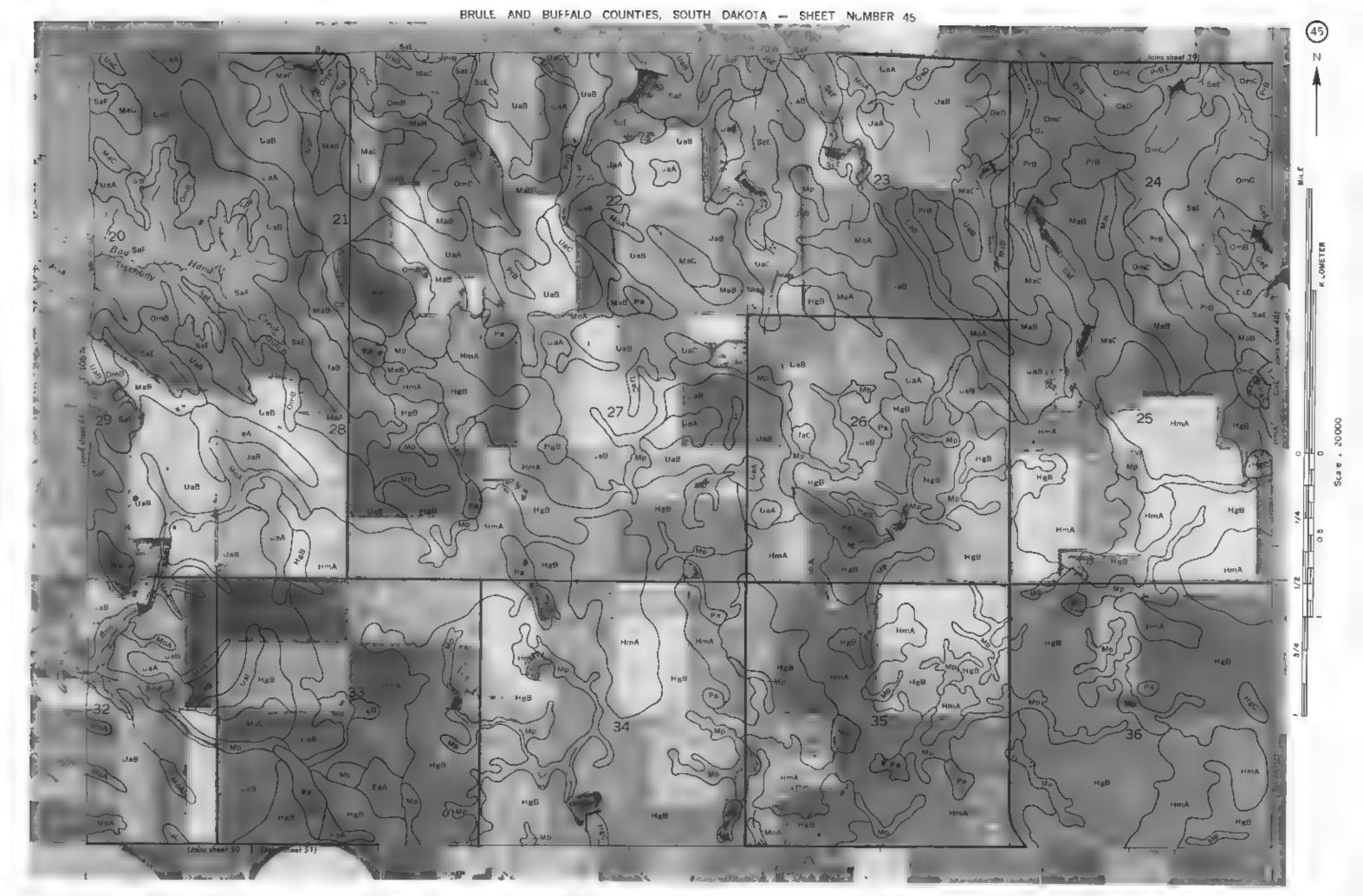
BRULE AND BUFFALOR COUNTIES SOUTH DESIGNATION OF SOUTH DESIGNATION OF THE STREET

BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO 4.

The deploy of Standard and the Counties of Operation of Counties and companies the counties of

ORALE AND BUFFALOR COUNTRY SOUTH DAY OF NO 42





BRULE AND BUFFALO ( OUNTIES SOUTH DAKOTA NO 46

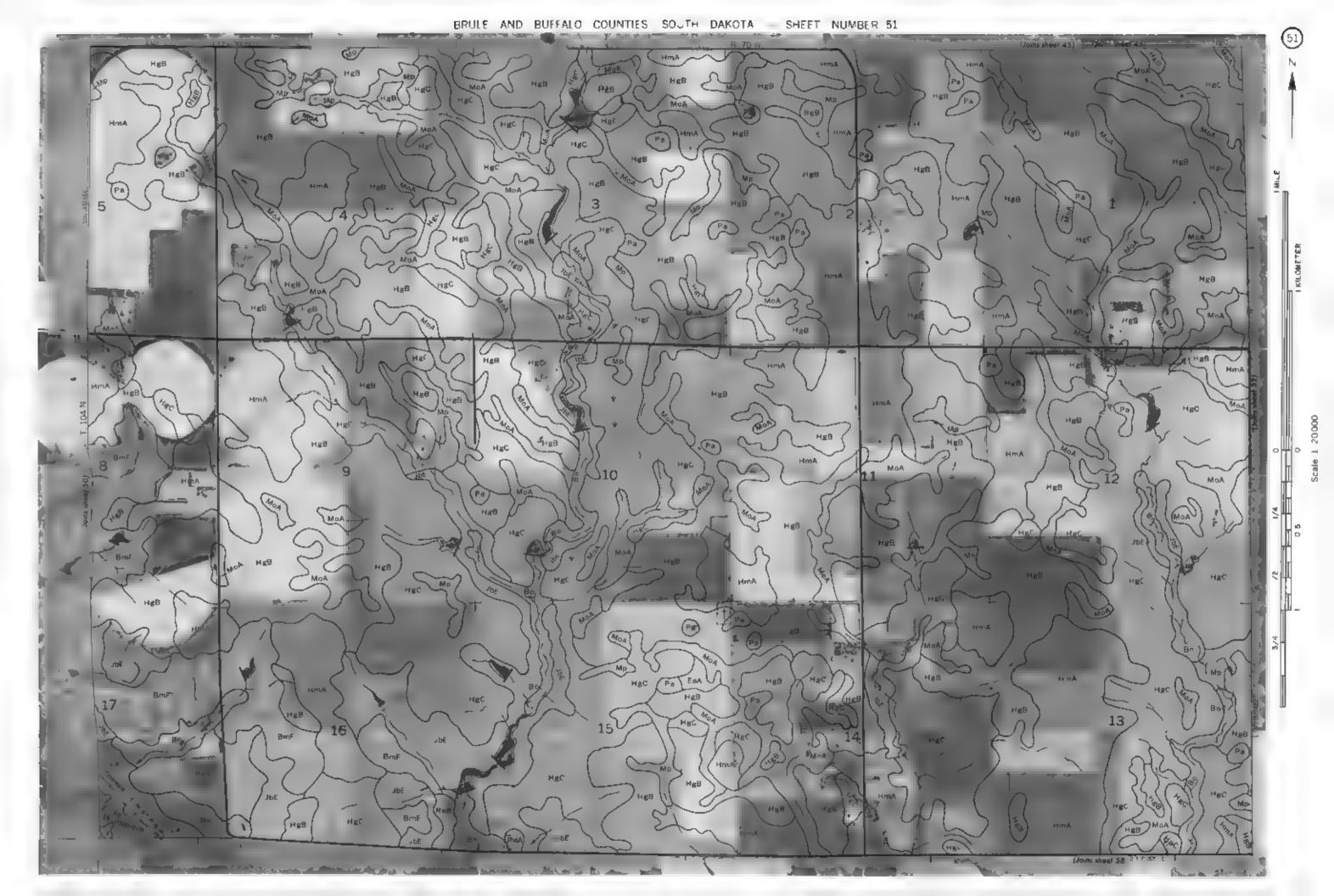
BRULF AND BUFFALO COUNTIFS SOUTH DAKOTA NO 47

THOS COMPAND OF A COMPAND OF THE COUNTIFS SOUTH DAKOTA NO 47

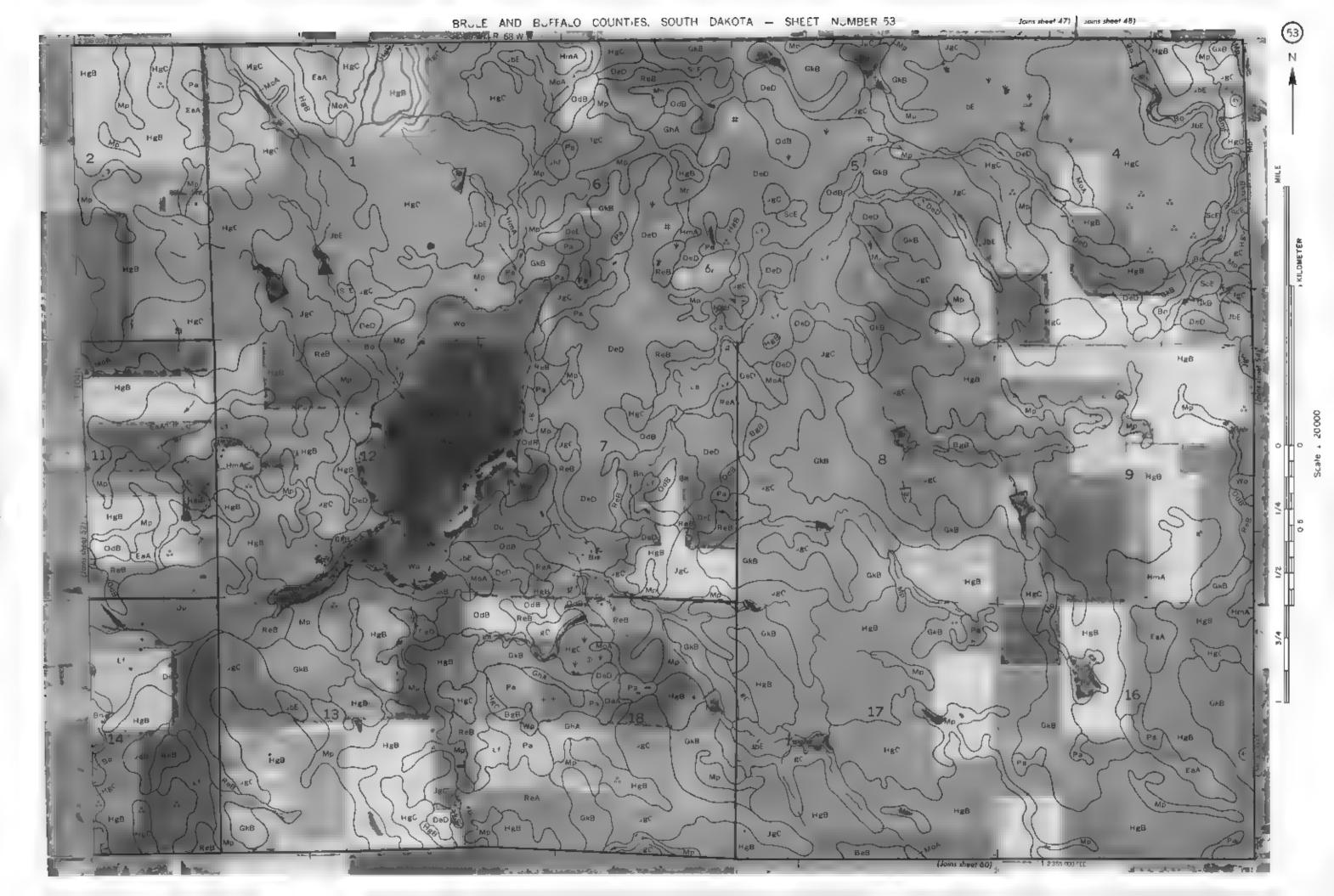
THOS COMPAND OF THE COUNTIES COUNTIES OF THE COUN

The section of the sour products in the University of the section

The rate content of the second tenth of property in the second of the se



IN THE CHARLES AND BUTCHERS IN THE CONTROL MINISTER ASSESSMENT OF STREET AND BUTCHERS SOUTH DAKOTA NO 52



The Participants of the product of the University Special and Demonstrate Countries Co

The majes complete as Taking perhapsymental temperature in the relationship special appropriate special programment of the specia



BRULE AND BUFFALO COUNTIES SOUTH DAK OTA NO 58

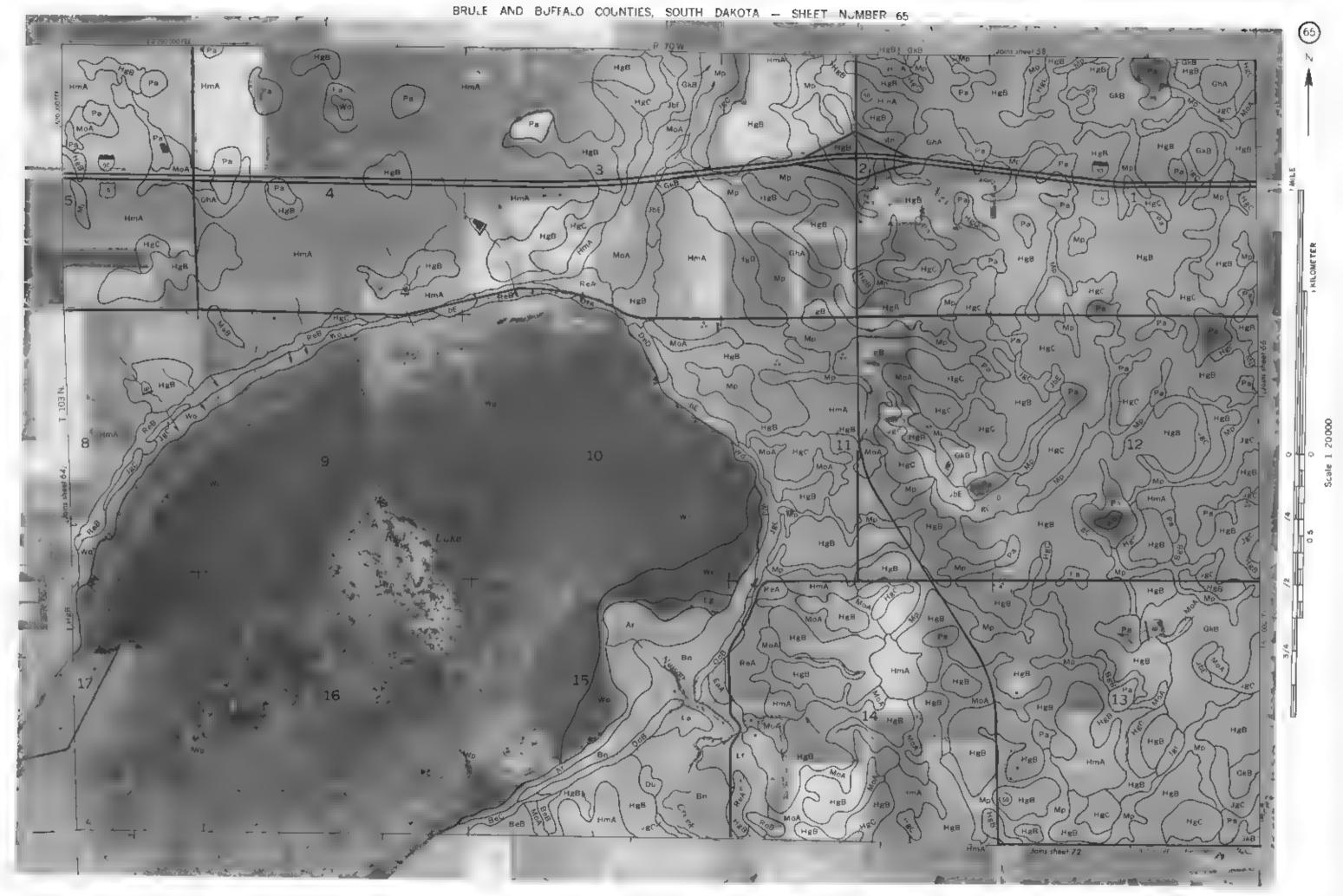
BRULE AND BUFFALO COUNTRES SOUTH DAKOTA NO 59
Anny Corporate Programme Management of the American Source of programme of the American Source of programme of the American Source of programme of the American Source of programme of the American Source of programme of the American Source of programme of the American Source 
BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO 60

BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO 61

19.39 B. Arthodos Bis and protection to the La Detection of Agriculture Scientistic processed cooperated support

BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO 62

The upper concess on 10th was determined in the 11 a Boarders of April 11 we associated street and account agree of BRULE AND BURFALLO COUNTILES, SOUTH BAKOTA NO 64



The art is considered the programmer of the a resolved of function for combustions forced and constitue affected.

BRULLE AND BUFFALCOCOUNTEST SOUTH DAKO IA NO 66

BRULE AND BUFFAL O COUNTIES, SOUTH DAKOTA NO 68

SPULE AND BUFFALO COUNTIES SOUTH DAKOTA NO 69
We continue of the property of the Desire of the part of the property agents.

The tag is completed BET and deflections for the Department of Section 2011 of the Control of th

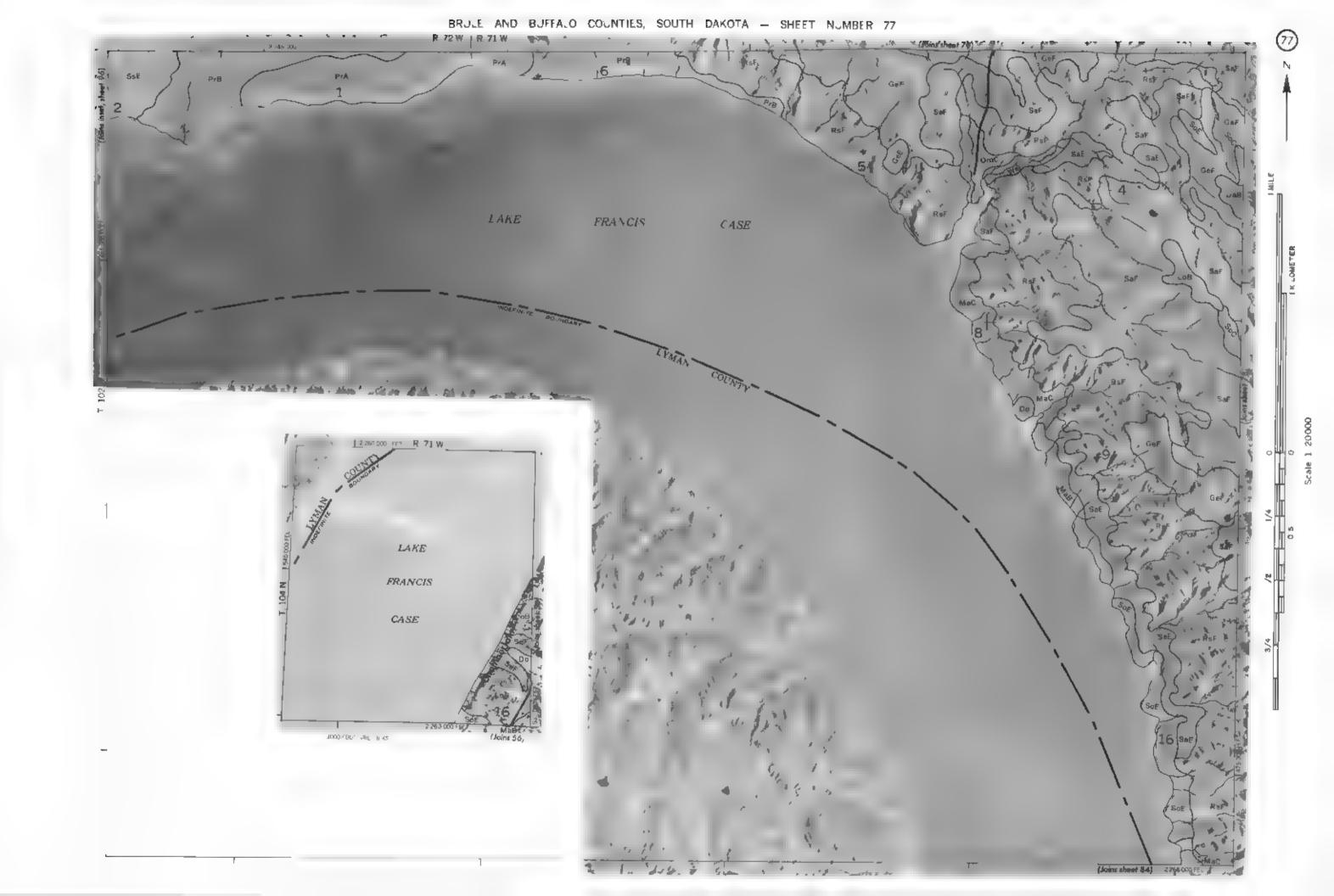
BRULE AND BUFFALO COUNTIES. SOUTH DAKOTA - SHEET NUMBER 71

BRULE AND BUFFALO COUNTIFS SOUTH DAKOTA NO 23 state compare of contractions are not contracted to decrease the read copporting production of contractions and contraction of their as accordant engineer.

BRULE AND BUFFALO CONTING SOUTH DAYS SOUTH DAKOTA NO 72

BRULE AND BUFFALO COUNTIES SOUTH BAKOTA NO 74

he age conclusion 193 and physicists the in Department of colours the consolution described in progression to the colour p



THE EXTREMENT OF THE PROPERTY

SRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO 79
sec. complete William participation of prompting participation of prompting participation of prompting participation of prompting participation of prompting participation of partici

The sq. concess this was properly by the consequent in the concess of some parameter, properly and the control of the control

BRULE AND BUFFALO COUNTRE SOUTH DAKOTA NO 8.

19 for in model of the mode production in the interval of the control of the con

In the current files a program of the comment of foundation in controlling stress of controlling secure.

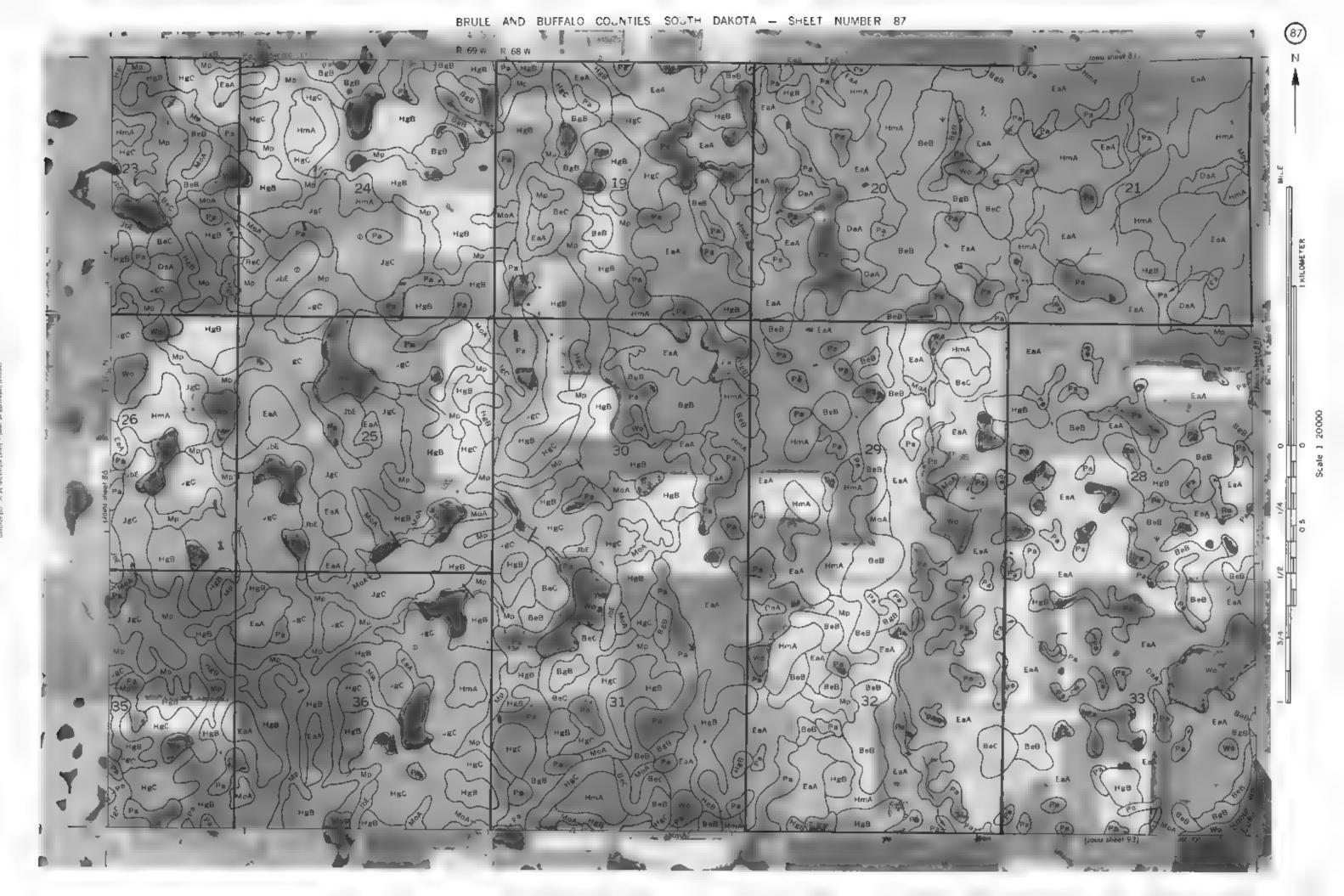
BRULE AND BUFFALCEOUNTIFS SOUTH DAKOTA NO 82

THE CONTRACT OF STATE

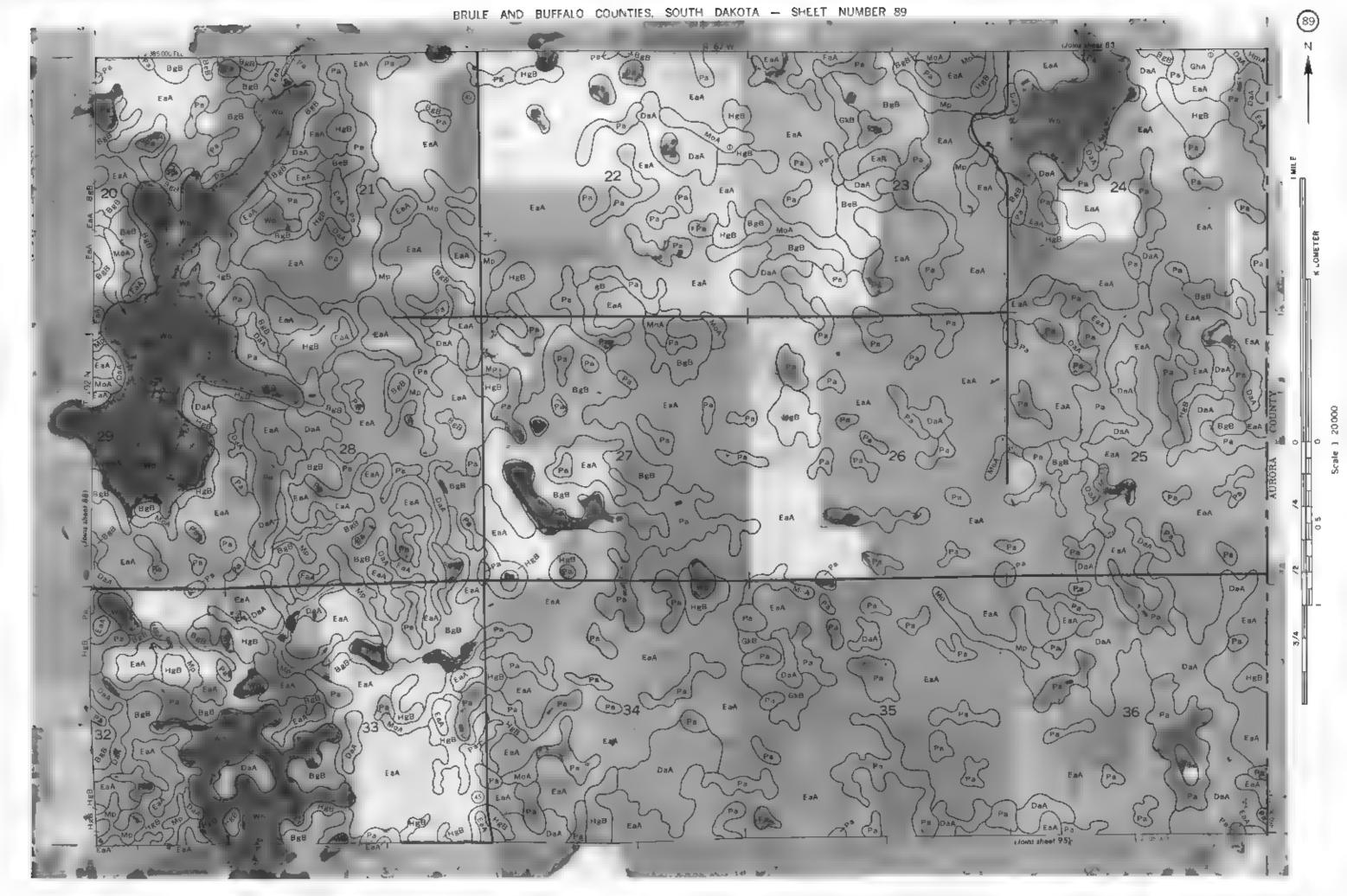
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA - SHEET NUMBER 85

The explication of the organization of the universal and consistent solutions and consistent engineers where the consistent solutions are also as a second of the consistent solutions are also as a second of the consistent solutions.

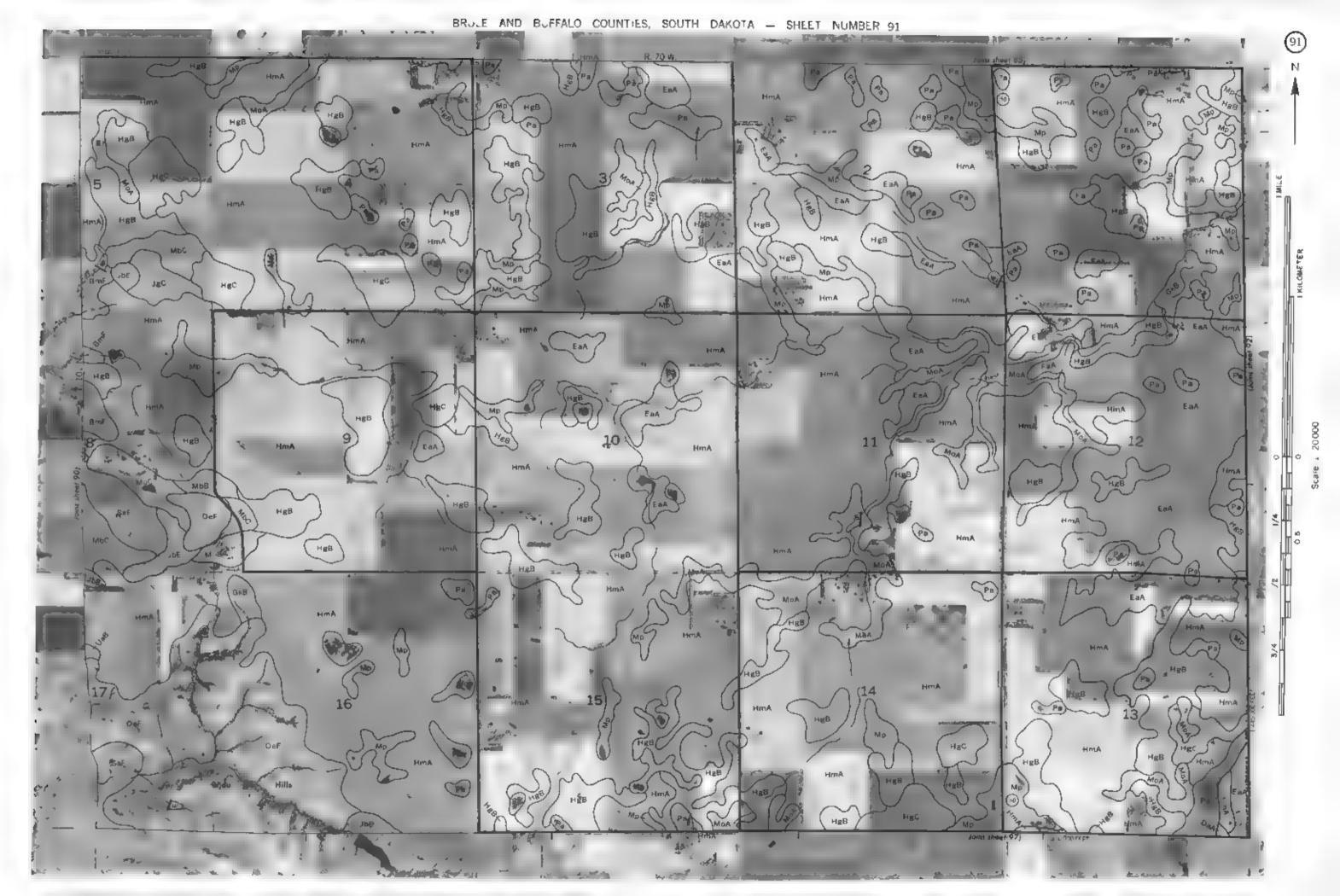
BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO 86



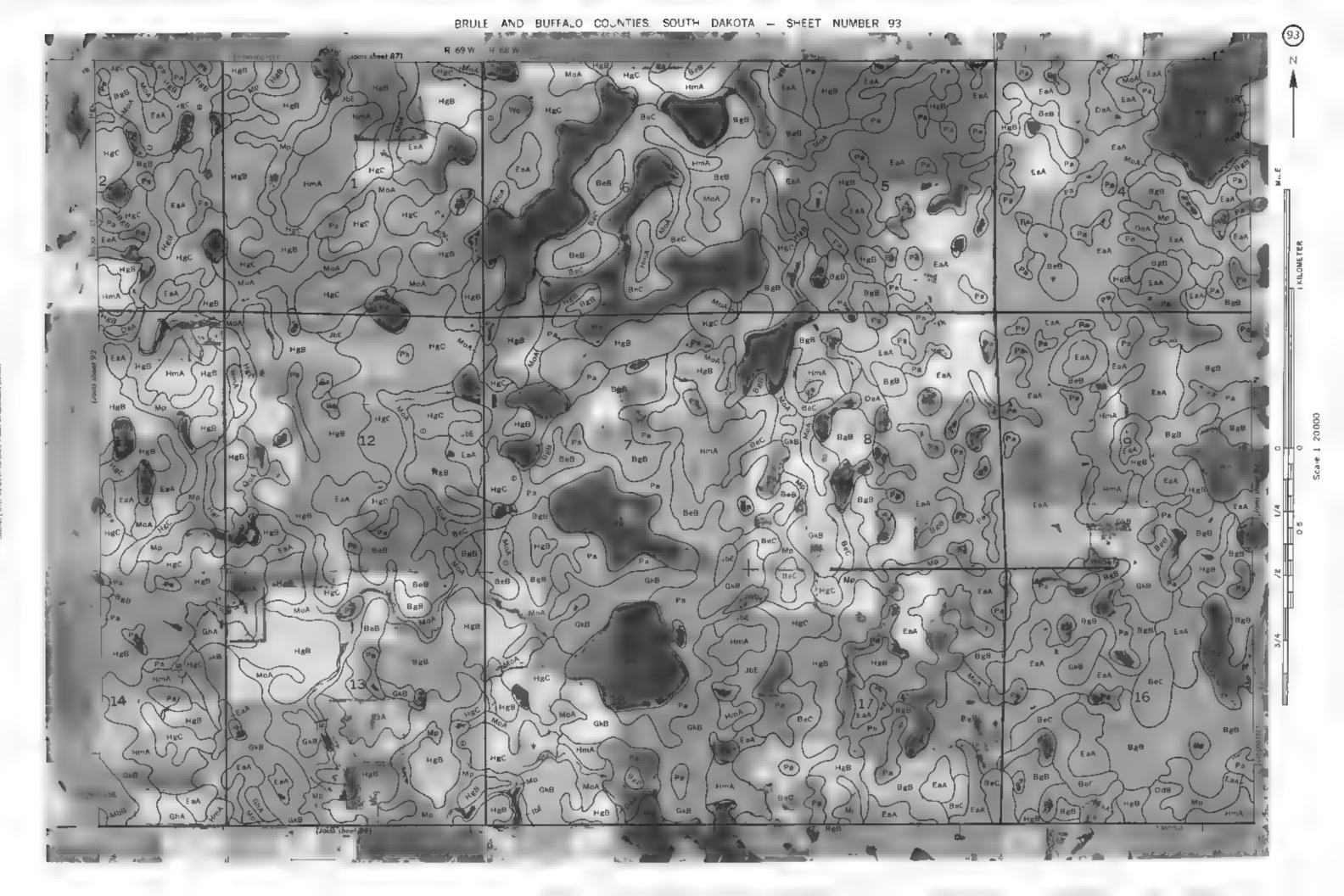
IN THE INCOMES OF BUILDINGS PROSPERS IN THE SHADOW AS A STATE OF SERVICE AND SHADOW AS A S



in may in complete an institute photograph by the III is depreted of Aprillate Section (inspection and inspection and institution and institution and inspection and institution and instituti



The state of the second program is the second without the consequence of the second consequence of the second program of the second



PROLE AND BUFFALO COUNTIES SOUTH DAKE IN 99 AND SOUTH DAKOTA NO 94



The upper paper of the property of the University of Archive at control to the property again.

BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO 96



It say is completed on PRIA commit perhaps for like in X Dissurfaces of Apriculture, Shi Commercian Service and cooperating spectron—
Cooperate grid locks and used devices contained of shown, are approximately positioned.

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 100

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 101
This tops is complete to Bills and a prolegates by the ILS. Beautiese of Apriculture. See Conservation Service and connecting agreeings.

Conditionals good littles and seed division connect. If shown, we approximately positional.